WEST VIRGINIA
GEOLOGICAL SURVEY

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(Frontispiece)

PLATE I.—Rich Mountain west of Beverly where the Staunton and Parkersburg Pike passes through a wind-gap at elevation 3025′ B., looking north toward old homestead on the estate of Grace Hart Johnson. Here the battle of Rich Mountain was fought on July 11, 1861, the Confederate troops having been entrenched behind the house and barn, both of which show many marks of conflict. Topography is base of Pottsville Series with many boulders of Upper Raleigh (Sharon) Sandstone. (Photo by E. E. Harris.)

WEST VIRGINIA
GEOLOGICAL SURVEY

JAMES D. SISLER, State Geologist.

Randolph County

By

DAVID B. REGER, Associate Geologist.

WEST VIRGINIA UNIVERSITY
Morgantown
1931

MORGANTOWN PRINTING AND BINDING CO.
MORGANTOWN, W. VA.
1931

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LETTER OF TRANSMITTAL

Morgantown, W. Va.
September 1, 1931.

Honorable William G. Conley, President,
Geological Survey Commission,
Charleston, W. Va.

Dear Sir:

This book is the work of David B. Reger, who was formerly an assistant geologist with the West Virginia Geological Survey. The field work was done during the summers of 1926 and 1927. The text was completed September 1, 1930.

Randolph County is the largest county in West Virginia. It has many natural resources. In the past few years, particularly since new roads are being built, it has become a very popular spot for tourists and campers.

This volume discusses in great detail the various topics of geology concerning it. The chapters on mineral resources are particularly valuable and should be of great aid in the future development of minerals and mineral materials in this County. These minerals are principally coal, limestone, clay, building stone, glass-sand and road material.

The discussion of water-power possibilities and stream gaging records will be of value in aiding the hydroelectric developments in this county.

Chapters discussing the Paleobotany and Paleontology will be particularly valuable to those who are interested purely in the science of Geology. The discussion on Paleontology was written by the late John L. Tilton.

According to David White, Paleobotanist with the United States Geological Survey, Washington, D. C., there seems to be considerable doubt concerning the identity of the large fossil tree trunks which Mr. Reger states are contained in the Elkins Sandstone. They are possibly shapes caused by variations in sedimentation.

The manuscript of this report was edited by R. C. Tucker. Since the work on this report was done prior to my assumption of office, July 1, 1930, I am submitting it to you without comment other than it appears to be the same careful type of work which the author has done in similar reports.

Yours very truly,
JAMES D. SISLER,
State Geologist.

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Map I.—Showing Topography of Randolph County.
Map II.—Showing General and Economic Geology of Randolph County, with Structure Contours and Cross-Sections.

Plates.

Figures.

AUTHOR'S PREFACE.

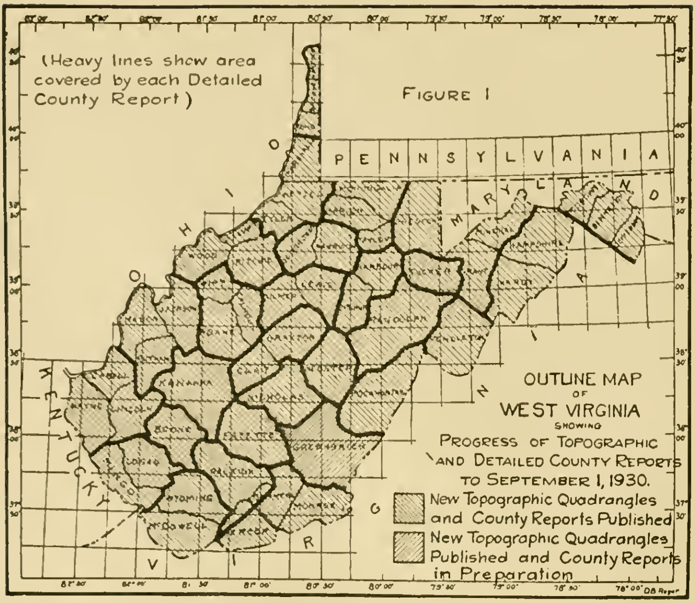
This book is a general geological report on Randolph County. In 1918 the Survey published a report on Barbour, Upshur and the Western Portion of Randolph County including the area west of Rich Mountain and north of Elk River the same having been prepared by the author with the assistance of D. D. Teets, Jr. In the present report the former information has been utilized but this portion of the county was not reworked in detail. The structure map, however, has been redrawn on the horizon of the Sewell (Sharon) Coal and the information on tests for oil and gas and coal test borings has been brought up to date.

In a separate Atlas Maps I and II show the topography and geology, respectively. On both these maps the topographic base is assembled and photolithographed from the standard topographic quadrangles as published by the United States Geological Survey in cooperation with the West Virginia Geological Survey, certain additions and corrections, principally roads, railroads, district lines, and place names, being added by the author. On this corrected base the geologic maps have been drawn.

Field work on the final report was begun by the author in the season of 1926 and was virtually completed in 1927. Normally the manuscript should have been finished in 1928 but other duties incident to the administration of the Survey from December, 1927, until October, 1929, unavoidably delayed its preparation.

On the study of plant fossils the author had invaluable cooperation from Dr. David White, Principal Geologist, United States Geological Survey, who spent some time in the field in 1927 and who has undertaken to study most of the collections. On paleontology the same invaluable help has been afforded by the late Dr. John L. Tilton, Paleontologist, West Virginia Geological Survey, who examined and identified nearly all the marine collections and who is the author of Chapter XV in which they are listed and discussed.

All chemical work has been carefully handled by Mr. B. B. Kaplan, Chief Chemist of the Survey, with the assistance of Harry J. Sigwart and Lee M. Morris. The author will also be indebted to Mr. R. C. Tucker, Assistant Geologist, for proof-reading and indexing the report; and cheerfully acknowledges the laborious work of Mrs. Inez White Glisan,


(Heavy lines show area covered by each Detailed County Report)
FIGURE 1
PENNSYLVANIA
MARYLAND
OHIO
KENTUCKY
VIRGINIA
OUTLINE MAP
OF
WEST VIRGINIA
SHOWING
PROGRESS OF TOPOGRAPHIC AND DETAILED COUNTY REPORTS TO SEPTEMBER 1, 1930.
New Topographic Quadrangles and County Reports Published
New Topographic Quadrangles Published and County Reports in Preparation

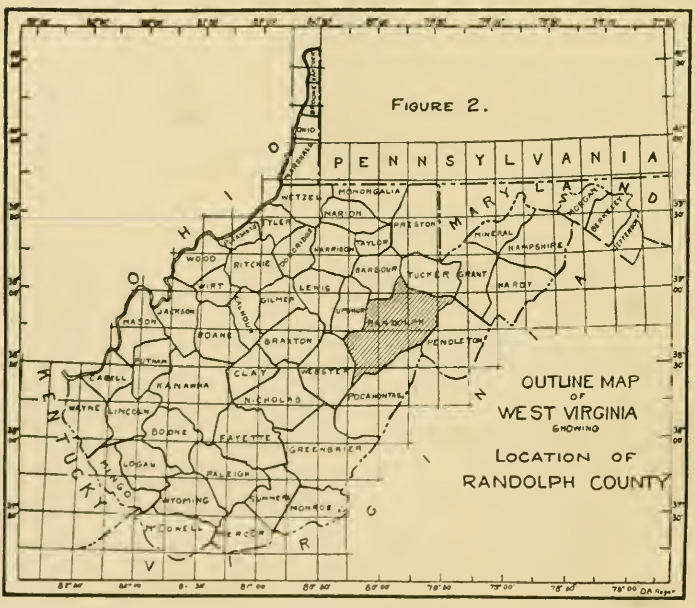


FIGURE 2.
PENNSYLVANIA
MARYLAND
OHIO
KENTUCKY
VIRGINIA
OUTLINE MAP
OF
WEST VIRGINIA
SHOWING
LOCATION OF RANDOLPH COUNTY

who copied most of the manuscript with some assistance from other members of the clerical staff, and of Mr. George W. Grow, who did most of the map drafting and prepared many of the tables.

It is manifestly impossible to make detailed mention of the many citizens of Randolph County who most generously furnished local guidance, often at personal inconvenience to themselves, while field work was in progress, but to all these general acknowledgment is made both on behalf of the author and in the name of the State whose interest was served. Special acknowledgment, however, is made to Mr. Claude W. Maxwell, Mr. J. B. Ward, Jr., Mr. Shelton Reger, and Mr. H. F. Cromer, whose extraordinary interest in mineral matters and whose wide knowledge of many interesting outcrops and exposures has perceptibly added to the value of the report; and also to Mr. M. N. Wilson whose cooperation made possible a fine collection of Devonian tree remains.

Finally the author expresses his obligation to the late Dr. I. C. White, former State Geologist, whose kindly supervision of the earlier part of this work will always be remembered with pleasure, and to Mr. James D. Sisler, present State Geologist, who has afforded the facilities for its completion.

DAVID B. REGER.

Morgantown, W. Va.,
Aug. 25, 1930.

ERRATA.

Page 37, line 5 from bottom, for "**Bounders**", read "**Boulders**".

Page 54, line 13 from bottom, line up Middle Fork (of Right Fork) with Left Fork.

Page 93, line 7 from top, for "**uplft**", read "**uplift**".

Page 119, top line, for page No. "**121**", read "**119**".

Page 125, line 9 from top, for "**101**", read "**102**".

Page 165, line 21 from top, for "**Rifle School**", read "**Riffle Creek School**".

Page 170, add "Thickness. Feet. Total. Feet. Intervals. Feet." over right-hand columns.

Page 218, line 16 from top, for "**country**", read "**county**".

Page 218, line 17 from top, for "**country**", read "**county**".

Page 343, line 23 from bottom, for "**combine doutcrop**", read "**combined outcrop**".

Page 539, line 5 from top, for "**Finchman**", read "**Fincham**".

Page 685, insert between lines 22 and 23 from top the following line: "**27 on Map II); and another (045R) from the lower 28 feet of**".

Page 685, omit line 24 from top.

Page 721, line 13 from bottom, for "**1-18**", read "**1-8**".

NOTE: Since the text of this report was printed, a well has been started for oil and gas west of Kerens on the axis of the Deer Park Anticline. On page 429, Mr. Reger estimates the depth to the Oriskany Sand at this point to be 1000 feet or more, the Coeymans at about 1400 feet, the Clinton ("White Medina") at about 2500 feet and the Trenton Lime at about 4000 feet. The well in the latter part of December, 1931, was at a depth of 2135 feet, in lime, and reached the top of the Oriskany at a reported depth of 1750 feet. Mr. Reger's estimates, therefore, appear to be too low for the depth to the Oriskany and the other estimates also will likely be found low. The interval from the Oriskany to the Clinton in the tables of oil and gas sand intervals on pages 406-7 and throughout the Chapter on Petroleum and Natural Gas has been estimated at 1500 feet by Mr. Reger. A well now drilling in Roane County found this interval to be about 1800 feet. At outcrop in the eastern counties along the Virginia line, the interval varies from 2100 to 2700 feet. It is therefore probable that the interval in the Kerens well will not be less than 1800 feet and probably 2000 feet or more since there will be some thinning westward from the outcrop to this well. ....J. D. S.

PLATE II.—View of Elkins looking north. Home of late Senator H. G. Davis in left background, followed on the right by home of late Senator Stephen B. Elkins, now part of Davis and Elkins College, other buildings of which stand farther to right. Tall tower is court-house. Topography mostly Portage (Photo. by E. E. Harris.)

PART I.

History and Physiography.

CHAPTER I.

HISTORICAL AND INDUSTRIAL DEVELOPMENT.

LOCATION.

Randolph County comprises the territory of this Report. It is located in the central eastern part of the State, being at the nearest point less than five miles from the Virginia State line and being included between the parallels of 38° 23′ and 39° 08′ North latitude and the meridians of 79° 20′ and 80° 17′ West longitude from Greenwich. In outline it is a rough polygon with its axis extending from northeast to southwest, the distance from its northeastern corner on the Red Creek Plains near Laneville to its most southern extremity on Turkey Mountain near Three Forks of Gauley being 64 miles. Its greatest width is from Grassy Mountain near Osceola northwestward to Middle Fork River near Lantz, approximately 33 miles. It is bounded on the north by Upshur, Barbour, Tucker, and Grant Counties; on the east by Grant, Pendleton, and Pocahontas; on the south by Pocahontas and Webster; and on the west by Webster, Upshur, Barbour, and Tucker. It is drained in part by certain tributaries of Cheat River including Dry Fork, Laurel Fork, Glady Fork, and Shavers Fork; and in part by Tygart River, Middle Fork River, and Buckhannon River, all of which eventually reach the Monongahela River as do the waters of Cheat; and in part by the waters of Holly, Elk, Gauley, and Williams Rivers all of which reach the Great Kanawha River. The Monongahela and Great Kanawha, in turn, empty into the Ohio River and finally, through the medium of the Mississippi, their waters reach the Gulf of Mexico.

The geographical position of the county may be observed on Figures 1 and 2 in this volume, and in greater detail on Maps I and II, enclosed in a separate Atlas accompanying this Report. In area Randolph is the largest county of the State.

TRANSPORTATION.

WATER WAYS.

Tygart River.

It is not apparent that the rivers of Randolph County will ever serve as important transportation units, as all have comparatively small volumes of water and generally the currents are swift. The current of Tygart River, from Valley Head to the narrows of Rich Mountain below Elkins, is very mild but farther down becomes rapid. In pioneer days before the advent of railroads this stream was used to some extent for rafting out logs but the timber is now mostly gone and easy transportation is afforded through the valley by railroads and improved highways. The river is not used for transportation and no scheme for its improvement would appear to be justified.

Shavers Fork of Cheat River.

Shavers Fork of Cheat River, throughout its length in Randolph County, is a turbulent stream, carrying no great amount of water and possessing few, if any, of the recognized requirements for navigability. Its lower portion, from Bowden to Parsons, is less swift than the upper section of the stream and has been used in a limited way for rafting logs. Since the advent of railroads it has not been employed for this purpose.

Elk River.

Elk River, a portion of the upper course of which lies in Randolph County, was once put to a very considerable use for rafting logs, mainly below Webster Springs toward the mouth at Charleston. In Randolph the river is not only small but all that portion in the county above the mouth of Valley Fork is an intermittent stream due to its flowage over porous limestone. This part of the river carries surface water only at times of flood and is clearly impossible as a transportation factor.

STEAM RAILROADS.

Baltimore and Ohio Railroad—Elkins and Grafton Line.

The Baltimore and Ohio Railroad affords through passenger service to Elkins from its main line at Grafton, using the tracks of its Belington Branch from Grafton to Belington and the tracks of the Western Maryland Railway from Belington to Elkins. Between Belington and Elkins, however, the trains are drawn by Western Maryland engines and manned by Western Maryland crews. As will be later described under the subject of the Coal and Coke Railway it has an independent freight line of its own from Belington to Elkins.

Baltimore and Ohio Railroad—Pickens Branch.

The Pickens Branch of the Baltimore and Ohio Railroad, extending from Weston, Lewis County, through Upshur to Pickens, Randolph County, had its beginning in a narrow-gauge railway built from Weston to Buckhannon in 1883, under the name of Weston and Buckhannon Railroad Company, but was taken over by the West Virginia and Pittsburgh Railroad Company and made a standard-gauge in 1891 and 1892, and in the same years was extended to Pickens. It was sold to the Baltimore and Ohio Railroad in September, 1889, and is now classed as part of its general system. According to C. W. Woolford, Secretary, the portion of this branch in Randolph County consists of 5.80 miles of main-line trackage and 1.20 miles of sidings.

Alexander and Eastern Railroad.—The Alexander and Eastern Railroad, a standard-gauge lumber line tributary to the Pickens Branch of the Baltimore and Ohio at Alexander, Upshur County, formerly extended up Left Fork of Buckhannon River and across Turkeybone Mountain into the valley of Back Fork of Elk River. According to A. W. Ewing, Civil Engineer, of Pickens, it has now been abandoned with the exception of about three miles from Alexander to Smooth Rock Run in Upshur County, there being no trackage in Randolph.

Chemical and Helvetia Railroad.—The Chemical and Helvetia Railroad is a narrow-gauge line tributary to the Pickens Branch of the Baltimore and Ohio at Selbyville, Upshur County. From this point it extends up Right Fork of Buckhannon River to Newlonton and thence up Left Fork of Right Fork of Buckhannon to the vicinity of Helvetia, Randolph County, according to late industrial maps. It was built in 1913 to haul cord-wood to the plant of the Buckhannon Chemical Company at Selbyville, there being no passenger service. It is approximately seven miles long, about three miles of which are in Randolph County.

Croft Lumber Company Railroad.—According to A. W. Ewing the Croft Lumber Company Railroad is tributary to the Pickens Branch of the Baltimore and Ohio at Suncrest on Right Fork of Buckhannon River 3½ miles below Pickens. This road follows down Right Fork one mile to Arvondale Junction and thence extends westward across the ridge for a few miles with one branch on the headwaters of Right Fork of Little Kanawha River, Upshur County, and another on Laurel Fork of Holly River, Webster County. Less than two miles of this road are in Randolph County.

Pickens and Webster Springs Railroad.—The Pickens and Webster Springs Railroad, tributary to the Pickens Branch of the Baltimore and Ohio at Pickens, extends southwestward across the mountain into the valley of Little Sugar Creek, Webster County, being a narrow-gauge lumber line with a limited passenger service. According to A. W. Ewing grading was begun by Senator J. N. Camden in 1893, steel was laid in 1900 and 1901, and the road was completed to Skelt in 1905, being first called the Pickens and Addison Railroad. Slightly more than four miles of this road are in Randolph County.

Coal and Coke Railway—Main Line.

The Coal and Coke Railway, extending in an east and west direction from Elkins to Charleston, a distance of 175 miles, is a valuable commercial carrier in Randolph County. It was originally built by the late Senator Henry G. Davis and his associates, the connecting link between Gassaway and Monroe having been completed in 1904. At first it operated from Roaring Creek Junction (Norton) into Elkins over the tracks of the Western Maryland Railway but finally built its own line into Elkins in 1911. Its entire common stock is now owned by the Baltimore and Ohio Railroad Company which now operates the road, the date of this acquisition being March 1, 1920. According to Mr. C. W. Woolford, Secretary of the Baltimore and Ohio, there are 17.77 miles of main-line trackage and 1.95 miles of siding in Randolph County.

Coal and Coke Railway—Coalton Branch.—The Coalton Branch of the Coal and Coke Railway extends from Norton southward up the valley of Roaring Creek to Coalton and Mabie, its main-line trackage, according to C. W. Woolford, being 7.92 miles and its sidings 5.39 miles. It mainly serves the coal mines of this valley but there is passenger and freight service between Elkins and Mabie. It was completed from Roaring Creek Junction (Norton) to Coalton in 1893 and from Coalton to Mabie in 1896.

Coal and Coke Railway—Belington Branch.—The Belington Branch of the Coal and Coke Railway extends from Leiter, Randolph County, northward down the western side of Tygart River to Belington, Lehigh, and Wilmoth Ford, Barbour County, a distance of slightly more than nine miles, of which 2.48 miles of main line and 0.06 mile of sidings are in Randolph County, according to C. W. Woolford. This road was completed in 1898.

Moore and Keppel Railroad.—The Moore and Keppel Railroad, tributary to the Coal and Coke at Midvale, Randolph County, and extending southward up the Left Fork of Middle Fork River 17.5 miles to Adolph, is a standard-gauge lumber and coal carrier, completed in 1915 and mainly built to serve the mill of Moore-Keppel and Company at Ellamore but now handling a considerable tonnage of coal from the mines at Cassity.

Western Maryland Railway—Main Line.

The main line of the Western Maryland Railway, extending from Baltimore, Maryland, westward to Belington, a distance of 292.3 miles, enters Randolph County near Montrose, extends down Leading Creek to Elkins, and thence down the eastern side of Tygart River to Norton and Belington, the latter point being in Barbour County. Its corporate history and construction are partly afforded by letters from L. F. Timmerman, former Secretary and Treasurer, and J. W. Broome, present Secretary, and partly by Maxwell[1], certain important company records having been lost in the fire of the Equitable Building of 1912. According to Timmerman it was first merged into a trunk line August 6, 1906, by the completion of a connection 60 miles long, between what was formerly known as Western Maryland Railroad Company at Big Pool, Maryland, and West Virginia Central and Pittsburgh Railway Company at Cumberland, Maryland, the latter line having been previously absorbed by the parent company November 1, 1905. The line from Elkins to Belington, however, was first built as the Belington and Beaver Creek Railroad, being purchased by the Western Maryland Railway November 1, 1905.

[1]Hu Maxwell, History of Randolph County, pp. 287-289; 1898.

According to Maxwell the original railroad through Mineral, Grant, and Tucker Counties was first organized as the Potomac and Piedmont Coal and Railroad Company in 1866, but was reorganized under the name of West Virginia Central and Pittsburgh Railway June 25, 1881. Construction from Piedmont westward was begun about April 20, 1880, completed to Elk Garden October 29, 1881; to Thomas and Davis November 1, 1884; to Parsons early in 1889; to Elkins August 18, 1889; and to Belington May 1, 1891.

According to Broome this unit of the system contains 54.92 miles of main-line trackage and 19.70 miles of sidings in Randolph County.

Western Maryland Railway—Weaver Branch.

The Weaver Branch of the Western Maryland Railway, extending from Belington in Barbour, southward to Weaver in Randolph County, a distance of 6.2 miles, is principally a coal-carrying road, but gives general freight and passenger service, having been first completed as a branch of the Belington and Beaver Creek Railroad. This branch is principally in Barbour, the trackage in Randolph County being less than one mile.

Western Maryland Railway—Huttonsville Branch.

The Huttonsville Branch of the Western Maryland Railway, tributary to the main line at Elkins, extends southward up the Tygart Valley to Huttonsville. According to J. W. Broome, Secretary, it was built originally by the West Virginia Central and Pittsburgh Railway, having been completed to Beverly May 1, 1892, and to Huttonsville February 5, 1899, its main-line trackage being 16.77 miles and its sidings 3.08 miles. General freight and passenger service is afforded.

Valley River Railroad.—The Valley River Railroad, tributary to the Huttonsville Branch of the Western Maryland at Mill Creek, was first begun by Hench, Dromgold and Schull who at that time built a lumber plant at Mill Creek. According to Merritt Wilson, of Elkins, the mill was acquired by the Wilson Lumber Company in 1911 and the railroad went to the Wilson interests at the same time. This road is a three-foot gauge line, mainly serving as a log carrier to the Wilson mill but also affording freight and passenger service. In 1926 it was 18 miles long, extending from Mill Creek up the Tygart Valley to Valley Head and slightly beyond, but later being completed to Mingo, about four miles farther up the valley. The Survey is indebted to M. N. Wilson, President, and J. S. Hamill, Manager of this railroad, for effective cooperation in quarrying and transporting a carload of valuable Devonian tree fossils as will be later described.

Western Maryland Railway—Durbin Branch.

The Durbin Branch of the Western Maryland Railway extends from Elkins eastward to Bowden on Shavers Fork of Cheat River; thence southward up Shavers Fork to Cheat Junction; thence eastward to Glady on Glady Fork of Dry Fork of Cheat; thence southward up Glady Fork to the Pocahontas County line at the divide between Glady Fork and Greenbrier River; and thence southward down West Fork of Greenbrier to Durbin, Pocahontas County. It was originally built by the late Senator Henry G. Davis and associates under the name of Coal and Iron Railway. According to J. W. Broome, Secretary of the Western Maryland Railway, it was completed to Durbin August 1, 1903, and was bought by the Western Maryland November 1, 1905. In Randolph County it has 28.76 miles of main-line tracks and 3.76 miles of sidings; in Pocahontas there are 17.62 miles of main track and 2.01 miles of sidings. At first this road was mainly used for hauling lumber but now it has become an important carrier of coal from the Cheat Mountain and Point Mountain coal fields. At Durbin it connects with the Greenbrier Division of the Chesapeake and Ohio Railway and in late years has received and carried eastward heavy consignments of through freight from the latter system.

R. Chaffey Railroad.—The R. Chaffey Railroad, tributary to the Durbin Branch of the Western Maryland at Glady, Randolph County, was originally the property of the Glady Manufacturing Company which built a mill at Glady in 1912 but was acquired by Mr. Chaffey in 1925. In the autumn of 1926 this road comprised 14 miles of 42-inch gauge track according to E. E. Thompson, Superintendent, its route being southward up East Fork of Glady and thence eastward to the headwaters of Laurel Fork of Cheat. It was mainly used for hauling logs to the Chaffey mill at Glady.

Western Maryland Railway—Elk River Branch.

The Elk River Branch of the Western Maryland Railway, consisting of acquired portions of the Greenbrier, Cheat and Elk Railroad and West Virginia Midland Railroad, starts at Cheat Junction, Randolph County, and extends southward up the valley of Shavers Fork of Cheat River to Spruce, Pocahontas County, where it turns westward across Cheat Mountain and passes through the divide between Tygart

River and Big Spring Fork of Elk River at Mace. From Mace it follows down Big Spring Fork to its mouth at Slaty Fork town and thence down Elk River to Bergoo and Webster Springs, Webster County. According to J. W. Broome, Secretary, there are, in the Greenbrier, Cheat and Elk portion, 41.67 miles of main track and 3.79 miles of siding in Randolph County, 23.71 miles of main track and 2.94 miles of siding in Pocahontas, and 8.93 miles of main track and 0.17 mile of siding in Webster. The portion of the line from Cheat Junction to Bergoo was originally built and owned by the Greenbrier, Cheat and Elk Railroad Company, having been completed about 1917, but was purchased by the Western Maryland Railway March 3, 1927. The portion from Bergoo to Webster Springs, about 10 miles long and not inincluded in the Webster County mileage figures above quoted, was built as a narrow-gauge by the West Virginia Midland Railroad Company in 1927 or 1928 but later a third rail was added to make a standard-gauge road and the line was purchased by the Western Maryland on May 31, 1929. In this agreement 17.51 miles of main track and 2.74 miles of sidings were acquired, the figures evidently including certain spur lines around Webster Springs.

Between Cheat Junction and Bergoo certain trackage rights are retained by the West Virginia Pulp and Paper Company, formerly interested in the Greenbrier, Cheat and Elk, and still operating a line from Spruce to Cass, Pocahontas County, as well as other lumber spurs. Between Bergoo and Webster Springs the West Virginia Midland, largely owned by the Pardee and Curtin Lumber Company interests, still retains the narrow-gauge track together with certain operating rights.

Central West Virginia and Southern Railroad.

The Central West Virginia and Southern Railroad, tributary to the Western Maryland Railway at Hendricks, Tucker County, is a standard-gauge road extending southward from that point up Dry Fork of Cheat River to Horton, Randolph County, a distance of 31.3 miles, of which 14.3 miles are in Randolph County. Of the above mileage over which trains are operated 29½ miles are owned by the railroad company and the remainder by the Spears Lumber Company, the latter trackage being at the southern end next to Horton. According to A. S. Lindsey, General Manager, the road was begun in October, 1895, under the name of Dry Fork Railroad, and was operated under that title until January 1, 1913, when the name was changed to its present status. This railroad affords a general freight and passenger service, its principal outbound freight being lumber, pulpwood and live stock, general supplies being hauled on the return trip.

Spears Lumber Company Railroad.—The Spears Lumber Company Railroad, tributary to the Central West Virginia and Southern at Horton and Whitmer, is a standard-gauge lumber road extending from Horton southward up Gandy Creek to Narrow Ridge Run near Osceola, thence eastward to the top of Allegheny Mountain and the Randolph-Pendleton County line, and thence southeastward by a devious route to the eastern side of Spruce Mountain near Spruce Knob. In the autumn of 1927 this road was approximately 15 miles long of which about 9 miles were in Randolph County. This railroad was built for private use by the predecessors of the Spears Lumber Company, starting about 1894, as will be later detailed in the history of the lumber company.

HIGHWAYS.

State Roads.

Following a revision of the road laws by the Legislature of 1921 the State Road Commission has indicated on its official map and has otherwise designated certain existing or projected highways as **State Routes,** the construction and maintenance of which have been undertaken by the State through the agency of the Road Commission, together with such assistance as may be had from the United States Government. When these projects are finally completed the routes become **State Roads.**

From the 1929 edition of the State Route Map of the Commission, in conjunction with the more detailed Government topographic maps, the writer has compiled the following description of State routes in Randolph County, their terminals in other counties or at State lines being indicated:

State Route No. 56.—State Route No. 56 begins at Grafton, Taylor County, extends southward into Barbour County passing through Philippi, Belington, and Junior; enters Randolph County and passes through Harding, and thence up the Tygart Valley through Elkins, Beverly, Mill Creek, and Huttonsville, being coincident with Route No. 24 between Beverly and Huttonsville. From Huttonsville it extends southeastward, crosses Cheat Mountain, crosses Shavers Fork of Cheat River at Cheat Bridge, crosses Back Allegheny Mountain; and thence enters Pocahontas County, passing through Durbin and Bartow, and reaching the Virginia State line at the summit of Allegheny Mountain where is becomes Virginia State Route No. 39 and reaches Staunton. From Beverly to the Virginia State line it is coincident with the Staunton and Parkersburg Pike, a pioneer route of much historic significance. State Route No. 56 is paved from Grafton to Huttonsville and from Durbin to Bartow, and is elsewhere usually passable.

State Route No. 24 (Seneca Trail).—State Route No. 24, otherwise known as the Seneca Trail, starts at the National Road (U. S. No. 40) at Keysers Ridge, Maryland, passes southwestward across that State through Oakland and Redhouse, being partly or wholly known as Maryland Route No. 37; enters Preston County, West Virginia, passes through Breedlove and goes southwestward across Tucker County through Pierce, Hambleton, Parsons, and Moore and enters Randolph County at the head of Leading Creek. In Randolph it passes generally southward through Montrose and Kerens to Elkins and thence up the Tygart Valley coincident with State Route No. 56 through Beverly, Mill Creek, and Huttonsville. From Huttonsville it continues southward up the Tygart Valley through Spangler, Valley Head, and Mingo and reaches the Pocahontas County line at Mace. Beyond Mace it descends to Marlinton and thence follows the Greenbrier Valley southwestward to Lewisburg and Ronceverte, but at the latter point leaves the Greenbrier and goes southwestward through Union, Peterstown, Princeton, and finally Bluefield at the Virginia State line. It is paved continuously from Keysers Ridge to Huttonsville, all graded and partly paved from Huttonsville to Marlinton, all paved from Marlinton to Rock Camp beyond Union, all graded and partly paved between Rock Camp to Princeton with the possible exception of a few miles in a northward projection of Virginia near Narrows and Glenlyn, and all paved from Princeton to Bluefield. When fully completed this should become one of the finest scenic highways in the State.

State Route No. 15.—State Route No. 15 starts at Valley Head, Randolph County, passes westward through Monterville and thence into Webster County where it follows the high summit of Point Mountain for many miles, reaching Elk River at Webster Springs. From this point it goes southwestward through Cowen, Camden on Gauley, and Craigsville, reaching U. S. Route No. 19 near Muddlety, Nicholas County. The entire route is graded and is mostly graveled from Webster Springs to Muddlety. The portion of the route along Point Mountain affords an unobstructed view northwestward to the Ohio Valley and beyond.

State Route No. 5.—State Route No. 5 starts at Harrisonburg, Virginia, being known as Virginia Route No. 814 in that State, extends westward into Pendleton County, West Virginia, and passes through Franklin, Riverton, Mouth of Seneca, and enters Randolph County at the top of Allegheny Mountain. It then decends the mountain to Dry Fork of Cheat River at Harman, goes southward up Dry Fork to Job, turns westward and successively crosses Rich Mountain, Laurel Fork, Middle Mountain, Glady Fork, Shavers Mountain, and Shavers Fork, passing en route through Wymer, Evenwood, and Alpena. At Shavers Fork it passes through Bowden and thence follows westward along Shavers Fork for a few miles, climbs to the summit of Cheat Mountain and then descends westward to Elkins. From Elkins it goes westward to Norton, being coincident with Route No. 56 in this short sector. From Norton it goes southward to Coalton and reaches the Staunton and Parkersburg Pike just west of Mabie, then turning westward and coinciding with this old highway to Linn, Gilmer County. From Randolph it passes into Upshur County at Burnt Bridge on Middle Fork River and thence passes through Buckhannon, Weston, Linn, Glenville, Normantown, Millstone, Arnoldsburg, Spencer, Ripley, and New Haven, reaching the Ohio State line at Mason City: Much of this route is still ungraded and unpaved but in Randolph County there is paving from Elkins to Mabie and farther west it is also paved from Buckhannon to Normantown. Certain other sectors are graded and some are partly graveled.

State Route No. 40.—State Route No. 40 leaves State Route No. 24 at Pierce, Tucker County, passes southward through Thomas and Davis and thence through the high Canaan Valley by way of Cortland and descends to Flanagan Hill (Red Creek P. O.) and to Dry Fork of Cheat River at the mouth of Red Creek. Here is enters Randolph County and follows Dry Fork southward to Harman where is connects with State Route No. 5. Only that portion of the route between Pierce and Davis is paved, most of the remainder being still ungraded.

County Roads.

All roads in the county not assumed by the State Road Commission are built and maintained by local taxation under the supervision of the County Commissioners. From Cheat Mountain westward most of the county is fairly well covered with a network of dirt roads, few of which have been graded or paved and most of which are passable to automobile traffic only about two-thirds of the year. In the region east of Cheat Mountain there are few roads of any sort and these, with the exception of State Routes Nos. 5 and 40, may be traversed with an automobile with extreme difficulty even during the summer months. According to the Report of the State Road Commission for 1914 Randolph County has 1,000 miles of roads, inclusive of those now operated by the Commission. Some changes in the county road system have been made since that date but the additional mileage has not been extensive.

GENERAL DESCRIPTION.

MISCELLANEOUS ITEMS.

Formation.—Randolph County, the largest in the entire State, was established by act of the Virginia General Assembly, passed November 29, 1786, as follows, according to Lewis[2]:

> "That from and after the first day of May, one thousand seven hundred and eighty-seven, the county of Harrison shall be divided into two distinct counties, that is to say, so much of the said county lying on the southeast of the following lines, beginning at the mouth of Sandy Creek; thence up Tygart's Valley River to the mouth of Buckhannon River; thence up the said river including all the waters thereon; thence down Elk River, including the waters thereof, to the Greenbrier line, shall be one distinct county, to be called and known by the name of Randolph; and the residue of said county shall retain the name of Harrison."

The boundaries mentioned in this brief act are somewhat difficult to decipher but Maxwell[3] gives the following clarifying statement, together with certain following changes and additional facts of interest:

> "Randolph County was formed from Harrison in 1787 and included all of the present county of Tucker, all of Barbour east of the river (Tygart—D. B. R.), all of Upshur east of Buckhannon River, and a considerable portion of Pocahontas and Webster. It lost territory in 1821 when Pocahontas was formed; again in 1843 when Barbour came into existence, and in 1851 it gave up some of its territory to Upshur, and five years later 350 square miles were cut off to form Tucker; and in 1860 Webster took a strip; and after all of these losses Randolph still is the largest county in the State. The white man's home on the waters of the Monongahela, within West Virginia, was first planted in Randolph. In this county occurred the first Indian massacre in the State."

[2]Virgil A. Lewis, History of West Virginia, p. 560; 1889.
[3]Hu Maxwell, History of Randolph County, p. 3; 1898.

The county, as above outlined was named after Governor Edmund Jennings Randolph, of Virginia. Its present boundaries, as carefully surveyed by topographers of the United State Geological Survey, are delineated on Map I and II, accompanying this Report in a separate Atlas.

Area.—The present area of Randolph County, as determined with planimeter by the writer from the topographic sheets of the United States Geological Survey, is as follows:

Districts.	Square Miles.
Roaring Creek	66.30
Middle Fork	160.95
New Interest	45.41
Leadsville	78.35
Beverly	71.24
Valley Bend	67.37
Huttonsville	137.69
Mingo	137.26
Dry Fork	281.77
Total for County	1,046.34

Relief.—The surface of Randolph County varies in elevation from 1,750 feet above sea-level at Laurel, where Tygart River crosses the Randolph-Barbour County line, to 4,760 feet at the western end of the high ridge known as the Roaring Plains four miles east of Harman, making a total difference of 3,010 feet.

Climate.—Compared to the western and northwestern portions of West Virginia the climate of Randolph County may be classed almost entirely as of the mountain type, since little of its topography is below the 1,800-foot level and most of it is above 1,900 feet. At Elkins, for instance, the elevation is 1,930 feet and being within the Tygart Valley which is the lowest cultivated region of large extent in the county, this figure represents much milder conditions than may be expected in the higher lands. On the high mountains and plateaus of the southern end of the county, varying from 3,500 to 4,500 feet above sea-level, conditions become much more severe in winter than is the case in the Tygart Valley and the summer season is perceptibly shorter.

A feature worthy of much notice in the climate of this county is the high average annual precipitation (rainfall), which at Elkins is 47.68 inches and at Pickens 64.85 inches, as compared to 40 or 50 inches in most of the northwestern counties. It is claimed that this high precipitation is largely responsible for the magnificent stand of timber that once covered Randolph County and for the rapid growth that now takes place in localities which have not been fire swept.

The following tables concerning temperature, precipitation, and snowfall at Elkins; temperature, precipitation, and snowfall at Pickens; precipitation and snowfall at Cheat Bridge; and precipitation and snowfall at Horton, furnished by H. C. Howe, Meteorologist, United States Weather Bureau, Parkerburg, West Virginia, give the main climatological facts for the county. These tables appear in regular order as detailed above, with due credit to local observers:

Monthly and Annual Mean Temperatures in Degrees Fahrenheit at Elkins.

(Harris A. Jones, Observer.)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1899	30.2	24.4	40.7	49.6	60.4	67.6	69.4	69.6	59.7	54.4	42.4	30.6	49.9
1900	31.4	28.0	35.0	47.6	58.4	67.0	70.4	72.4	67.0	56.8	41.6	31.6	50.6
1901	30.7	23.0	39.0	43.6	57.4	67.3	73.8	70.0	61.8	50.7	32.4	29.6	48.3
1902	28.4	23.6	39.7	45.6	61.6	63.0	70.2	67.0	60.8	53.0	46.8	31.8	49.3
1903	29.9	32.3	48.6	48.3	60.6	61.3	69.0	68.4	61.4	51.2	35.6	24.8	49.3
1904	25.9	27.9	41.0	44.6	58.4	66.6	68.6	67.2	63.4	49.5	37.2	31.1	48.4
1905	23.6	23.6	44.6	48.4	62.1	68.0	71.1	68.7	63.0	52.0	39.0	34.2	49.9
1906	36.6	30.2	34.8	50.5	58.8	68.6	69.5	73.0	67.5	52.2	42.4	34.6	51.6
1907	37.9	29.0	47.2	42.3	56.3	62.4	69.8	67.1	64.2	47.8	39.4	32.9	49.7
1908	28.1	28.3	46.8	52.1	61.4	66.8	71.6	67.8	63.3	52.4	41.6	34.6	51.2
1909	35.8	38.8	37.4	49.8	58.4	69.1	67.8	68.8	61.4	47.6	47.4	26.6	50.7
1910	31.3	30.6	47.5	50.5	55.2	64.4	71.9	68.0	65.8	55.8	34.6	26.9	50.2
1911	36.6	36.8	37.6	47.2	63.0	68.0	70.6	71.6	66.7	54.9	38.0	38.3	52.4
1912	22.0	25.8	38.6	52.7	60.7	64.3	70.4	67.0	66.9	53.4	40.6	34.2	49.7
1913	41.0	31.2	43.6	49.1	58.6	67.4	71.4	70.0	61.8	52.6	43.0	34.3	52.0
1914	35.2	28.0	34.0	49.2	60.1	69.5	69.8	69.6	60.5	55.2	41.4	28.7	50.1
1915	31.8	36.8	31.2	51.8	58.8	65.6	69.0	66.8	65.8	54.2	42.8	30.1	50.4
1916	37.8	29.4	36.8	48.0	62.4	63.7	72.6	70.3	60.3	51.6	41.6	32.4	50.6
1917	32.6	28.9	40.0	49.2	53.6	65.0	70.4	69.4	60.1	47.2	37.0	22.5	48.0
1918	20.7	34.6	44.4	46.7	63.8	63.9	66.6	72.2	56.6	55.2	40.6	40.2	50.5
1919	31.6	31.9	40.9	48.4	58.8	69.0	70.5	66.4	62.0	60.3	41.4	29.1	50.9
1920	28.2	28.8	40.3	47.2	56.0	64.2	66.4	68.1	63.4	53.7	39.3	33.6	49.1
1921	35.0	35.6	51.0	51.9	58.4	68.6	72.6	67.6	68.3	51.3	44.8	34.6	53.3
1922	29.3	37.4	43.6	51.8	61.4	67.8	70.4	66.2	64.5	53.2	41.8	35.4	51.9
1923	34.0	29.2	39.5	48.0	57.8	67.2	69.0	68.9	63.6	49.4	40.9	41.7	50.8
1924	28.6	29.6	36.5	47.6	52.6	66.5	67.2	69.1	58.7	52.2	41.0	31.8	48.4
1925	32.3	39.8	41.5	52.8	54.5	68.8	69.2	67.7	68.0	47.6	38.7	31.0	51.0
1926	30.0	32.8	32.4	44.6	58.2	62.6	69.3	70.5	66.4	52.3	39 3	32.9	49.3
1927	30.6	39.0	43.7	49.2	58.3	62.0	68.4	63.3	63.8	54.4	46.6	32.6	51.0
1928	30.9	32.8	38.1	45.8	55.7	64.1	69.4	70.9	58.4	54.4	41.3	33.8	49.6
1929	31.2	28.6	44.4	52.6	57.6	64.5	68.6	65.3	62.9	49.4	40.8	36.5	50.2
Means	31.3	30.9	40.7	48.6	58.7	66.0	69.8	68.7	63.2	52.4	40.7	32.3	50.3

Monthly and Annual Totals of Precipitation in Inches at Elkins.

(Harris A. Jones, Observer.)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1899	4.26	4.04	5.12	2.69	6.12	5.98	5.87	1.43	5.01	1.15	2.04	3.64	47.35
1900	2.07	3.88	4.41	1.37	2.51	5.93	5.59	2.61	2.56	2.46	5.93	3.05	42.37
1901	3.65	1.17	3.50	5.61	5.95	5.94	2.98	4.23	3.14	0.50	2.90	6.92	46.49
1902	3.90	2.86	4.39	3.61	4.08	5.22	6.23	3.61	4.81	2.76	3.92	5.88	51.27
1903	3.79	5.72	3.64	3.38	5.37	5.51	3.60	2.48	1.69	1.79	2.71	2.16	41.84
1904	2.75	3.18	4.25	3.06	3.60	5.25	4.07	4.59	1.70	2.16	1.02	3.19	38.82
1905	3.48	2.32	4.89	2.96	5.41	3.93	4.56	3.97	1.83	3.70	2.30	2.29	41.64
1906	3.84	1.24	5.38	5.29	3.66	6.46	3.16	4.84	4.24	3.81	2.10	5.07	49.09
1907	8.93	2.87	4.75	3.90	3.21	7.26	11.10	5.27	7.10	3.73	3.84	3.41	65.37
1908	4.02	3.22	5.58	4.95	8.42	2.77	7.88	2.60	0.88	0.33	0.77	2.83	44.25

Monthly and Annual Totals of Precipitation in Inches at Elkins.—(Continued).

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1909	2.98	3.20	3.28	5.39	2.96	7.78	4.85	3.20	4.30	4.58	2.31	2.02	46.85
1910	5.77	2.22	0.68	2.24	3.91	8.05	4.07	2.70	3.61	2.21	2.26	2.72	40.44
1911	8.04	2.18	4.75	5.26	2.23	4.97	3.67	10.42	6.87	6.11	2.75	3.30	60.55
1912	2.88	2.11	5.50	2.67	4.35	4.93	10.61	3.30	4.18	1.10	2.46	2.87	46.96
1913	5.30	2.24	3.11	3.75	5.63	2.83	8.67	4.56	5.09	6.23	5.47	3.45	56.33
1914	2.31	2.72	2.34	6.97	1.43	4.23	7.74	4.96	0.52	2.25	0.73	5.16	41.36
1915	5.14	2.62	1.69	2.28	2.86	2.45	3.40	6.21	3.04	4.42	3.10	4.04	41.25
1916	6.31	4.02	5.53	3.43	4.29	4.86	6.29	3.13	4.87	2.32	1.50	3.20	49.75
1917	4.58	3.79	7.12	2.72	4.35	3.52	2.69	3.26	2.83	2.97	1.23	1.17	40.23
1918	5.11	3.61	5.61	4.66	5.87	5.32	1.68	5.43	3.06	3.40	1.60	5.93	51.28
1919	4.20	2.04	2.76	1.94	3.88	6.40	8.75	3.09	2.28	5.69	3.25	4.73	49.01
1920	4.66	3.10	4.57	5.45	2.19	3.83	5.27	3.33	3.35	1.07	3.72	2.78	43.32
1921	2.50	3.09	2.92	2.26	4.21	6.08	4.69	6.82	5.15	3.30	5.30	5.07	51.39
1922	3.18	4.26	5.32	3.77	3.25	7.40	5.75	2.96	1.31	1.20	1.55	4.53	44.48
1923	5.10	3.73	3.32	3.20	1.96	6.94	3.73	3.08	2.33	0.89	3.28	6.95	44.51
1924	3.64	4.07	4.41	4.15	8.88	5.18	5.86	3.81	5.39	0.26	2.65	2.69	50.99
1925	4.12	1.97	3.91	3.32	2.60	6.11	4.81	1.18	4.55	6.85	3.21	1.56	44.19
1926	4.20	3.98	3.58	3.90	3.04	3.86	4.57	6.57	5.00	4.15	2.04	5.56	50.45
1927	4.19	5.71	2.81	7.25	4.13	5.23	7.35	5.08	3.47	4.56	4.47	3.43	57.68
1928	2.81	2.53	3.33	6.74	3.94	7.99	4.81	4.77	2.34	1.71	3.98	2.68	47.63
1929	3.21	2.58	3.42	4.49	8.09	4.62	5.26	1.81	3.28	7.28	4.55	2.41	51.00
Means	4.22	3.11	4.06	3.96	4.27	5.38	5.47	4.04	3.54	3.06	2.87	3.70	47.68

Monthly and Annual Snowfall in Inches at Elkins.

(Harris A. Jones, Observer.)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1899	10.2	19.7	5.7	4.4	0	....	....	....	....	0	0.8	10.1	50.9
1900	5.3	15.5	20.5	0.9	0	....	....	....	....	0	5.4	2.9	50.5
1901	25.1	8.7	4.5	11.6	0	....	....	....	....	0	11.7	5.5	67.1
1902	14.8	11.0	12.0	22.6	T	....	....	....	....	0.2	1.7	11.3	73.6
1903	9.9	13.0	0.6	1.2	T	....	....	....	....	T	7.4	7.7	39.8
1904	13.9	18.0	6.6	5.1	0	....	....	....	....	0.2	5.7	12.3	61.8
1905	36.6	10.5	1.3	3.8	0	....	....	....	....	0.3	0.1	3.9	56.5
1906	6.2	9.9	21.6	1.7	T	....	....	....	....	4.9	3.0	8.1	55.4
1907	3.3	9.9	7.5	10.4	0	....	....	....	....	T	T	10.8	41.9
1908	22.5	14.3	1.0	0.3	T	....	....	....	....	0	5.1	9.3	52.5
1909	4.8	5.7	11.3	4.8	0.1	....	....	....	....	T	T	13.2	39.9
1910	17.4	10.7	0.6	T	T	....	....	....	....	1.4	4.3	23.1	57.5
1911	11.9	12.2	6.4	5.8	T	....	....	....	....	0	2.5	2.3	41.1
1912	13.8	6.5	1.9	0.1	0	....	....	....	....	0	0.6	10.7	33.6
1913	2.1	4.6	3.2	T	0	....	....	....	....	T	20.5	4.8	35.2
1914	13.4	13.4	20.0	T	0	....	....	....	....	0.5	4.0	11.3	62.6
1915	13.2	5.5	14.8	T	0	....	....	....	....	T	3.8	12.9	50.2
1916	8.3	17.3	13.4	2.4	0	....	....	....	....	T	T	16.4	57.8
1917	7.0	14.1	8.5	2.7	T	....	....	....	....	4.8	3.2	9.0	49.3
1918	19.6	6.5	T	11.0	T	....	....	....	....	0	T	7.6	44.7
1919	13.7	6.5	2.2	0.4	0	....	....	....	....	0	3.0	20.5	46.3
1920	5.8	20.1	9.1	3.7	0	....	....	....	....	0.3	3.9	8.2	51.1
1921	5.9	11.3	T	0.8	0	....	....	....	....	T	2.4	15.5	35.9
1922	15.4	5.2	6.0	T	0	....	....	....	....	0	4.6	4.5	35.7
1923	7.1	9.6	2.8	T	0.5	....	....	....	....	0	T	3.5	23.5
1924	2.2	15.2	12.4	3.9	T	....	....	....	....	0	6.4	2.3	42.4
1925	11.3	1.2	5.8	1.0	T	....	....	....	....	5.5	2.1	8.1	35.0
1926	11.5	24.0	18.2	5.3	0	....	....	....	....	T	1.6	4.6	65.2
1927	10.4	5.8	T	0.5	0	....	....	....	....	T	8.7	2.6	28.0
1928	7.8	7.5	23.6	17.0	0	....	....	....	....	T	5.0	2.7	63.6
1929	11.0	12.9	8.7	0.5	T	....	....	....	....	T	8.0	9.1	50.2
Sums	361.4	346.3	250.2	121.9	0.6	....	....	....	....	18.1	125.5	274.8	1498.8
Means	11.7	11.2	8.1	3.9	T	....	....	....	....	0.6	4.0	8.9	48.4

Monthly and Annual Mean Temperatures in Degrees Fahrenheit at Pickens.

(Dr. J. L. Cunningham, Observer.)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1877	....	....	37.2	47.8	53.4	67.1	70.7	66.7	59.7	50.6	40.8	40.0	....
1878	29.0	35.5	45.0	53.4	55.9	62.1	72.4	68.6	59.6	48.6	39.6	26.4	....
1879	28.4	27.7	40.6	45.9	59.2	63.9	71.4	66.2	56.9	54.7	40.6	42.5	....
1880	43.1	35.8	39.5	50.4	62.3	66.4	67.5	68.0	62.9	48.9	34.4	24.8	....
1881	28.5	31.1	36.3	44.3	59.3	65.5	69.2	66.8	67.9	56.8	43.0	39.2	....
1882	35.6	40.6	44.7	49.9	57.0	65.4	66.9	66.9	61.9	56.1	42.4	31.6	....
1883	33.7	38.2	35.9	50.3	58.5	68.8	70.0	66.5	61.8	56.6	45.0	36.4	....
1884	26.1	40.6	41.0	46.4	57.8	67.5	66.6	66.1	63.3	54.0	40.1	35.8	50.4
1885	30.7	25.7	32.6	47.3	56.4	65.7	69.5	67.2	59.9	47.5	39.6	34.4	....
1886	30.7	25.7	32.6	47.3	56.4	65.7	69.5	67.2	59.9	47.5	39.6	34.4	48.0
1887	29.0	29.0	38.6	51.5	58.4	65.1	68.2	67.0	61.9	49.6	39.5	28.9	48.9
1888	31.0	42.0	37.4	47.7	63.2	65.8	73.8	66.8	60.3	48.9	40.7	35.1	51.1
	1877-1888 (inc.) for Helvetia, W. Va.												
1902	....	....	....	45.6	63.0	63.6	69.2	66.8	62.0	55.3	48.5	31.6	....
1903	30.4	33.1	49.6	49.4	62.0	61.7	69.4	68.1	62.2	52.5	37.1	24.8	50.0
1904	27.4	28.5	41.7	45.0	59.0	....	67.0	67.1	63.8	....	37.4	29.8	....
1905	23.2	21.5	44.0	46.5	61.0	67.6	70.0	66.7	62.0	50.5	42.2	32.2	49.0
1906	35.5	29.3	33.2	48.3	57.8	66.0	68.4	70.4	65.4	51.6	40.4	31.5	49.8
1907	36.0	27.1	45.9	40.7	54.7	61.4	67.7	64.8	62.8	46.4	37.0	30.6	47.9
1908	25.3	27.1	45.1	51.9	60.2	66.0	70.2	66.8	62.2	53.0	42.4	32.9	50.3
1909	35.9	37.1	36.4	50.4	58.1	67.8	65.8	65.8	59.2	46.5	48.6	25.4	49.8
1910	31.2	30.0	49.2	50.8	54.9	61.8	69.1	65.4	62.6	53.4	33.6	24.4	48.9
1911	36.5	36.7	38.2	46.4	63.3	65.6	67.0	69.2	64.2	53.4	32.6	38.6	51.4
1912	23.3	24.8	38.8	53.0	62.0	63.4	67.3	64.6	64.8	55.4	41.0	33.8	49.4
1913	41.0	30.4	42.8	48.4	59.0	67.6	69.1	67.7	59.9	50.5	42.6	34.8	51.2
1914	32.4	28.0	33.2	48.1	60.1	67.5	67.0	67.0	58.5	54.6	41.7	29.4	49.0
1915	31.5	38.2	30.6	53.4	58.9	63.9	65.8	64.2	64.0	56.5	45.4	30.1	50.2
1916	39.7	29.8	36.6	47.2	62.4	61.6	69.7	67.2	58.8	54.9	43.6	31.9	50.3
1917	32.4	29.3	40.0	46.7	52.4	63.8	66.8	67.0	59.5	48.0	38.2	23.7	47.3
1918	22.2	35.0	46.2	48.0	63.8	63.3	65.0	....	56.2	55.8	39.6	39.4	....
1919	30.4	31.9	....	48.9	58.5	69.1	70.9	65.8	62.1	60.0	41.2	29.6	....
1920	27.8	27.2	39.8	45.4	55.8	63.6	66.3	66.7	63.8	54.0	37.4	30.9	48.2
1921	33.0	35.6	51.0	51.0	57.4	67.6	71.4	66.6	67.2	50.6	43.4	32.8	52.3
1922	27.3	35.6	42.6	50.8	61.0	67.2	68.9	64.6	64.1	52.8	40.1	34.2	50.8
1923	31.2	27.5	37.8	47.7	57.6	65.9	67.8	67.6	63.2	48.8	39.8	39.8	49.6
1924	27.0	27.6	33.7	47.6	51.8	65.2	65.8	67.4	56.9	52.4	40.4	30.0	47.2
1925	30.2	38.7	40.2	50.0	53.0	67.0	67.0	66.6	66.4	45.4	36.3	27.6	49.0
1926	27.5	30.1	30.4	42.8	56.7	61.7	67.8	69.1	64.6	48.7	35.4	29.4	47.0
1927	27.6	35.4	40.1	46.7	56.1	61.0	66.2	61.7	62.5	53.8	43.0	28.6	48.6
1928	26.4	28.5	37.2	44.0	52.7	61.0	67.2	68.0	55.6	52.4	36.6	31.1	46.7
1929	28.1	27.4	41.9	50.4	55.2	61.6	66.2	62.2	61.0	46.8	37.6	32.4	47.6
Av.	30.7	30.8	39.4	48.2	58.2	64.9	68.4	66.6	60.2	50.6	39.4	32.0	49.1

Monthly and Annual Totals of Precipitation in Inches at Pickens.

(Dr. J. L. Cunningham, Observer.)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1877	5.87	0.94	4.96	2.99	3.64	6.12	4.76	2.51	4.05	3.76	6.29	2.47	48.36
1878	5.27	2.00	4.38	4.01	5.69	4.84	7.31	4.89	2.84	4.65	7.98	5.14	59.00
1879	3.13	3.15	5.48	1.09	3.70	4.57	6.13	3.64	2.63	1.64	3.07	6.44	44.67
1880	4.30	5.51	6.57	5.77	3.47	6.45	5.57	5.54	3.35	3.88	0.59	4.51	55.51
1881	3.80	4.51	3.75	4.15	4.58	6.99	9.48	1.45	1.37	4.51	3.23	8.81	56.63
1882	9.50	6.95	6.65	4.26	7.15	8.27	7.65	12.60	7.04	1.30	2.76	3.27	77.40
1883	5.26	8.18	5.37	6.72	4.38	6.55	7.84	1.73	3.09	5.21	2.05	5.15	61.53
1884	6.00	5.24	4.96	2.70	4.51	5.69	5.12	4.30	0.92	2.45	2.66	4.30	48.85
1885	5.90	2.65	2.54	5.04	3.50	4.66	4.41	3.14	1.43	5.80	4.06	3.19	46.32
1886	3.45	2.71	4.46	3.44	7.08	5.46	4.82	3.77	4.37	1.35	4.53	4.57	50.01

Monthly and Annual Totals of Precipitation in Inches at Pickens.—(Continued).

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1887	3.75	7.68	3.02	4.91	3.65	8.14	2.86	3.96	3.49	1.20	1.24	2.18	46.08
1888	4.32	2.79	4.38	2.61	5.85	2.81	6.28	4.67	2.77	8.14	2.97	3.05	50.64
From 1877 to 1888, inclusive, values are for Helvetia, four miles north of Pickens.													
1902	....	....	....	6.31	6.09	6.38	7.28	1.71	3.44	2.82	4.03	9.95	....
1903	6.45	9.58	6.11	6.19	5.70	7.39	3.60	5.85	2.78	2.71	4.98	3.30	64.64
1904	5.82	4.55	6.10	5.52	4.84	5.00	4.70	4.16	2.83	2.00	2.20	5.91	53.63
1905	4.98	3.66	4.75	5.57	6.24	4.76	6.48	4.10	1.91	2.46	2.23	3.38	50.52
1906	3.53	1.57	6.36	5.39	5.48	7.31	4.52	10.72	5.44	5.41	4.34	9.61	70.28
1907	11.54	4.83	7.10	6.66	3.84	8.69	13.36	6.83	3.43	4.71	5.42	4.45	80.86
1908	8.19	4.80	6.01	6.88	8.82	4.94	7.53	5.03	1.22	1.28	1.16	4.80	60.66
1909	6.27	6.48	6.19	8.57	3.34	7.71	6.01	5.79	6.77	5.09	3.85	4.00	70.07
1910	10.10	6.56	1.52	4.65	5.26	10.60	6.74	3.67	5.46	2.96	4.41	6.90	68.83
1911	12.63	2.73	7.86	6.55	0.86	6.36	3.55	5.55	8.30	8.61	5.54	4.75	73.29
1912	6.93	5.08	9.36	4.24	7.50	8.19	11.00	5.65	6.43	2.32	4.08	5.55	76.33
1913	8.67	6.15	5.48	5.48	7.42	4.20	7.08	6.15	8.89	6.71	8.83	2.92	77.98
1914	5.43	6.96	7.11	10.05	2.55	2.96	4.63	6.27	0.85	3.24	1.99	7.91	59.95
1915	11.38	5.98	4.32	2.89	4.79	5.07	6.30	6.10	4.78	4.43	4.59	7.19	67.82
1916	8.07	9.19	9.88	4.58	4.95	5.31	4.27	4.34	7.88	2.86	1.95	6.28	69.56
1917	7.67	7.73	14.20	4.20	7.07	4.80	7.28	2.10	4.36	5.25	3.65	3.07	71.38
1918	9.22	6.60	7.07	5.95	10.28	5.95	5.24	5.50	3.35	5.59	4.15	7.71	76.61
1919	6.66	1.96	3.38	1.92	7.47	8.27	8.09	8.40	3.09	11.88	6.54	7.35	75.01
1920	6.41	5.49	3.33	7.26	4.66	4.89	7.73	8.42	3.18	1.92	3.99	3.12	60.40
1921	2.82	4.23	4.34	4.85	8.02	5.93	3.76	6.97	6.94	5.76	8.51	7.59	69.72
1922	4.68	5.04	8.19	6.76	5.19	7.42	6.62	4.75	2.15	2.28	2.49	7.14	62.71
1923	6.51	7.38	5.50	3.62	4.49	9.18	8.36	12.42	4.63	2.19	4.82	10.96	80.06
1924	5.40	8.18	6.74	5.53	10.27	6.25	7.63	3.21	8.68	0.62	4.11	5.69	72.31
1925	7.07	4.25	6.59	4.12	4.22	5.05	6.46	2.12	3.31	11.16	5.74	2.77	62.86
1926	7.74	7.26	9.82	5.54	3.57	4.14	6.12	8.73	10.26	6.90	3.76	10.57	84.41
1927	9.58	8.64	4.97	10.20	7.16	3.98	7.55	8.03	2.52	5.73	4.79	5.01	78.16
1928	4.55	6.06	6.48	7.04	3.29	11.69	4.66	7.96	4.14	2.61	9.41	2.64	70.53
1929	6.67	4.24	4.84	6.34	7.67	6.64	7.52	5.65	3.82	9.16	6.73	4.64	73.92
Av.	6.55	5.32	5.92	5.26	5.48	6.24	6.41	5.46	4.20	4.31	4.24	5.46	64.85

Monthly and Annual Mean Snowfall in Inches at Pickens.

(Dr. J. L. Cunningham, Observer.)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1877	....	....	10.4	....	2.5	....	....	....	....	....	6.2	0.7	....
1878	29.6	6.3	2.0	....	....	....	....	....	....	5.0	21.5	32.0	96.4
1879	9.7	21.8	0.5	....	....	....	....	....	....	....	4.0	2.2	38.2
1880	2.5	16.2	4.5	....	....	....	....	....	....	....	8.5	32.8	64.5
1881	10.5	12.8	28.2	....	....	....	....	....	....	....	1.2	8.8	61.5
1882	13.8	19.0	2.8	....	....	....	....	....	....	....	7.2	13.0	55.8
1883	21.0	4.0	8.2	....	....	....	....	....	....	....	....	19.8	....
1884	26.8	6.5	12.0	3.8	....	....	....	....	....	....	6.0	8.2	63.3
1885	8.2	23.0	17.8	10.5	....	....	....	....	....	....	15.0	11.8	86.3
1886	24.8	19.8	12.5	6.0	....	....	....	....	....	....	15.0	27.0	105.1
1887	23.0	3.0	12.5	....	....	....	....	....	....	....	1.7	7.8	....
From 1877 to 1887, inclusive, values are for Helvetia, four miles north of Pickens.													
1902	....	....	....	36.0	....	....	....	....	....	T	4.0	33.5	....
1903	29.0	27.0	2.0	4.0	T	....	....	....	....	T	18.5	33.0	113.5
1904	34.0	26.0	8.0	7.0	....	....	....	....	....	....	5.0	16.0	96.0
1905	50.0	17.0	T	13.0	....	....	....	....	....	....	T	11.0	91.0
1906	11.0	12.0	26.0	2.0	T	....	....	....	....	9.0	11.0	42.0	113.0
1907	6.0	19.0	12.0	40.0	....	....	....	....	....	1.0	3.0	17.0	98.0
1908	61.0	47.0	2.0	T	1.0	....	....	....	....	....	5.0	12.0	128.0
1909	12.0	22.0	24.0	15.0	0.5	....	....	....	....	4.0	3.0	35.0	115.5

Monthly and Annual Mean Snowfall in Inches at Pickens.—(Continued).

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1910	43.0	39.0	4.0	7.2	T	....	....	....	....	3.0	15.0	51.0	162.2
1911	14.0	18.0	17.0	4.0	T	....	....	....	....	....	11.0	8.0	72.0
1912	34.0	27.0	13.0	1.0	T	....	....	....	....	T	8.0	18.0	101.0
1913	18.0	16.5	28.0	1.0	....	....	....	....	....	6.0	36.0	16.0	121.5
1914	31.0	23.0	54.0	3.0	....	....	....	....	....	1.0	7.0	30.0	149.0
1915	36.0	22.0	31.0	1.0	....	....	....	....	....	T	12.0	32.0	134.0
1916	15.0	36.0	50.0	14.0	T	....	....	....	....	....	4.0	28.0	147.0
1917	16.0	24.0	22.0	17.0	T	....	....	....	....	15.0	7.0	19.0	120.0
1918	46.0	13.0	2.0	10.0	T	....	....	....	....	T	7.0	22.0	100.0
1919	28.0	15.0	....	3.0	....	....	....	....	....	....	7.0	39.0	....
1920	15.0	38.0	23.0	17.0	....	....	....	....	....	T	13.0	23.0	129.0
1921	13.0	25.0	1.0	8.0	....	....	....	....	....	1.0	6.0	32.0	86.0
1922	35.0	14.0	25.0	0.5	....	....	....	....	....	....	7.0	5.0	86.5
1923	21.0	31.0	20.0	T	9.0	....	....	....	....	1.0	8.0	16.0	106.0
1924	5.0	51.0	30.0	9.0	1.0	....	....	....	....	....	24.0	7.0	127.0
1925	25.0	11.0	22.0	5.0	3.0	....	....	....	....	11.0	10.0	17.0	104.0
1926	37.0	55.0	60.0	12.0	....	....	....	....	....	4.0	6.0	11.0	185.0
1927	35.0	18.0	1.0	4.0	....	....	....	....	....	4.0	13.0	17.0	92.0
1928	24.0	35.0	45.0	33.0	....	....	....	....	....	T	30.0	9.0	176.0
1929	31.0	19.0	14.0	10.0	3.0	....	....	....	....	2.0	18.0	27.2	124.2
Av.	24.2	22.6	17.4	7.8	0.5	....	....	....	....	1.7	10.4	21.0	105.6

Monthly and Annual Totals of Precipitation in Inches at Cheat Bridge.

(H. F. Cromer, Observer.)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1921	....	....	....	....	....	....	2.99	5.05	6.80	3.88	8.45	6.57	....
1922	4.06	4.96	5.10	3.87	4.96	6.42	8.05	4.69	0.81	1.79	2.34	5.31	52.36
1923	5.51	4.60	4.62	3.36	1.96	6.49	5.79	4.00	4.36	1.27	4.26	8.04	54.26
1924	7.14	3.74	6.01	3.42	8.42	6.28	5.35	3.91	7.52	0.36	2.94	3.48	58.57
1925	4.21	2.31	4.01	2.34	3.84	5.08	4.50	2.11	....	....	....	....	....

Monthly and Annual Snowfall in Inches at Cheat Bridge.

(H. F. Cromer, Observer.)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1921	....	....	....	....	....	....	....	....	....	2.0	6.0	34.2	....
1922	28.0	17.5	8.5	3.0	....	....	....	....	....	....	....	6.0	....
1923	22.0	12.5	13.5	1.0	3.0	....	....	....	....	T	5.5	8.5	66.0
1924	10.5	24.0	44.5	5.0	6.0	....	....	....	T	....	7.5	10.0	107.5
1925	21.5	8.0	12.5	5.5	3.5	....	....	....	....	....	....	....	....

Monthly and Annual Totals of Precipitation in Inches at Horton.

(J. W. White, Observer.)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1925	3.67	1.70	3.80	2.68	2.84	4.82	3.08	1.28	2.83	5.24	3.17	1.60	36.71
1926	5.58	3.56	2.79	2.30	3.53	2.64	4.95	8.98	4.39	4.13	3.90	4.46	51.21
1927	3.90	6.04	1.84	7.00	5.30	2.68	5.34	5.26	1.72	6.00	2.99	4.21	52.28
1928	2.95	2.72	3.47	4.31	2.65	8.85	2.85	3.58	2.27	2.02	4.30	2.20	42.17
1929	4.12	2.86	2.66	5.05	7.53	3.76	3.63	2.03	3.78	9.93	3.98	2.54	51.87

Monthly and Annual Snowfall in Inches at Horton.

(J. W. White, Observer.)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1925	33.9	3.4	8.5	T	T	....	....	....	....	7.8	1.8	9.2	64.6
1926	39.9	36.7	19.5	0.5	....	....	....	....	....	T	0.2	4.0	100.8
1927	19.2	27.1	T	T	T	....	....	....	....	T	10.0	9.4	65.7
1928	13.8	18.5	41.4	24.0	....	....	....	....	....	1.1	18.4	5.0	122.2
1929	22.5	27.3	17.8	7.8	1.1	....	....	....	....	T	11.5	17.8	105.8

Population.—The following table, taken from the United States Census returns for 1920, shows the population of Randolph County for the last three enumerations, while a column has been added showing the unpublished 1930 figures for which Mr. Floyd E. Tallman, Elkins, W. Va., Supervisor of Census for the Eighth West Virginia District, is authority:

Population of Randolph County.

MINOR CIVIL DIVISION	1930	1920	1910	1900
Beverly District, including Beverly town	2,204	1,941	2,259	1,684
Dry Fork District, including Harman and Job villages, Whitmer town, and part of Laneville village	2,530	3,705	4,956	3,224
Huttonsville District, including Huttonsville and Mill Creek towns	2,358	2,256	2,936	1,638
Leadsville District, including Elkins city and Harding village	10,094	9,588	8,420	4,495
Middle Fork District	2,421	2,535	2,196	2,071
Mingo District	1,316	1,556	1,093	1,165
New Interest District, including Montrose village	1,118	1,150	1,256	1,215
Roaring Creek District, including Womelsdorf town	2,136	2,952	1,905	1,437
Valley Bend District	879	1,121	1,007	741
Totals for County	25,056	26,804	26,028	17,670

From the above table it is evident that a large increase of population occurred from 1900 to 1920, but that little increase took place between 1910 and 1920. The figures largely represent increase and decline in the lumber industry of the county. It will also be noted that the county suffered a total decline of 1,748 in population from 1920 to 1930, a decrease of 6.52 per cent.

Products.—The principal animal products of Randolph County are cattle, sheep, horses, poultry, hogs, and bees. The principal agricultural products are corn, wheat, buckwheat, hay, potatoes, apples, peaches, cherries, and grapes. The relative values of these products are uncertain.

The principal mineral and manufactured products are coal, coke, limestone, building stone, brick, lumber, and refrigerating units and fixtures. The coal of the Roaring Creek and Middle Fork Valleys has for many years been an industrial feature of great importance in the county and should so remain for many years to come. In quite recent years the mining of coal in the Cheat Mountain Field of the Shavers Fork Valley has actively begun and should greatly increase within a few years. The building stone industry is dormant, being largely confined to the local use of stone and the same is true of brick. In many respects the future of these products is not bright owing to the highly commercialized state of these industries in other regions where superior materials and more abundant markets exist. The lumber industry, which once constituted the main source of industrial revenue, has greatly declined owing to the depletion of virgin timber which is now almost entirely gone.

Crushed limestone and ground or burned lime have been produced in considerable quantity and these products are still being prepared and shipped although there has been a decline in recent years. The county has an inexhaustible supply of limestone suitable for such purposes and for the manufacture of Portland cement, and is deficient only in the high calcium content required in some of the special chemical uses to which limestone is now put. It would appear that a much greater use of this important resource of the county should eventually take place.

Property Valuation.—According to Hon. Edgar C. Lawson, State Auditor, the following table shows the property valuation for Randolph County for three years:

	1927	1928	1929
Real Estate	$13,286,915	$12,975,450	$12,416,980
Personal Property	5,167,330	5,010,850	4,988,260
Public Service Corporations	4,377,179	4,342,506	4,545,652
Totals	$22,831,424	$22,328,806	$21,950,892

Postal Service.—Randolph County is served partly by railway and bus transportation of mails and partly by star route and rural free delivery carriers. City delivery is afforded in Elkins. The following table, compiled from the United States Official Postal Guide for 1929, shows the number of post-offices in the county. Figures following the names of offices indicate the number of rural routes starting therefrom:

Alpena	Flint	Montrose—3
Bemis	Glady	Norton
Beverly—1	Harding	Osceola
Bluespring	Harman	Pickens
Bowden	Helvetia	Silica
Cassity	Huttonsville—1	Sully
Coalton	Job	Suncrest
Czar	Kerens—1	Valley Bend
Dryfork	Long	Valley Head
Elkins—3	Mabie	Weaver
Elkwater	Mill Creek—1	Whitmer
Ellamore	Mingo	Wymer
Evenwood	Monterville	

TOWNS AND INDUSTRIES.

Elkins.

Elkins, the county-seat and largest municipality in Randolph County, is situated on the flood-plain of Tygart River in the northwestern portion of the county just above the mouth of Leading Creek and near the northern end of the wide portion of Tygart Valley. Most of the city occupies low, flat ground 15 to 20 feet above the level of Tygart River, the elevation above sea-level at most points differing but little from that of the Government bench-mark of 1,930 feet as established near street level on the Western Maryland Building opposite the railroad station. In certain outlying sections the higher ground of the surrounding hillocks, 50 to 150 feet above the general city level, has been occupied for residential and institutional purposes, the sandy shale of these eminences being ideal for stability of structures and drainage, in contrast to the somewhat mucky nature of the flood-plain territory.

According to Maxwell[4] Elkins was laid off into lots and construction was begun in 1889, being named after the late Senator Stephen B. Elkins, who, in association with the late Senator Henry G. Davis and R. C. Kerens, was largely interested in the promotion and development of the city. Hodges[5], in a recent publication, gives the following account of the corporate history of the city:

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[4]Hu Maxwell, History of Randolph County, p. 291; 1898.

[5]M. S. Hodges, West Virginia Legislative Hand Book and Manual, p. 699; 1929.

> "Chartered by special act of the Legislature in 1901; amended in 1915 and 1917; amended in 1921 as to corporate limits, registration of voters and general powers of council; in 1923 to provide for additional officers and employees subject to vote of people at next election; amended again in 1927; elections biennially in March; estimated population 9,000."

The West Virginia Encyclopedia gives the date of incorporation as 1890.

By the Census of 1900 the population of Elkins was 2,016; in 1910 it was 5,260; and in 1920 had increased to 6,788. The estimate of Mr. Hodges for 1929 therefore indicates a continued and healthy growth. (The 1930 Census shows a population of 7,346). Substantial reasons are evident for this rapid growth. Originally established as a shop and operation center for the railroad interests which have now become a part of the Western Maryland, its early career was soon augmented by many woodworking and wholesale plants and by the county business which resulted from moving the county-seat from Beverly to Elkins in 1898. Later the establishment of Davis and Elkins College, the building of additional railroad and public, or semipublic, institutions, and the development of the lumber industry and coal mining plants in tributary territory contributed greatly to the varied character of its interests.

In physical surroundings Elkins has been greatly favored by nature. Directly southward is the broad expanse of the Tygart Valley; to the west is the high escarpment of Rich Mountain and to the east the still higher ridge of Cheat Mountain. From the higher residential portions of Elkins these two great mountains, the subsidiary foot-hills descending like steps toward the valley, and the valley itself, all combine to form a magnificent and most charming vista.

Davis and Elkins College.—Davis and Elkins College was founded in 1904, largely through the efforts and contributions of the late Senators Henry G. Davis and Stephen B. Elkins whose names it bears, and is under the control of the Presbyterian Church. As originally built this college was located on an eminence at the southern end of Elkins but in 1925 and 1926 it was moved to the Elkins Estate at the northern edge of the city where the former palatial residence of Senator Elkins and its surrounding 60 acres of grounds were donated by Mrs. Stephen B. Elkins, and several additional buildings were erected through the generous contributions of friends and patrons many of whom are citizens of Elkins. These handsome new buildings were almost entirely built of local Pottsville sandstone secured from the gap of Tygart Valley.

According to Dean Charles E. Albert, the physical plant of the college in the autumn of 1926 consisted of five buildings—Halliehurst Hall (Dormitory for Women), Liberal Arts Hall, Science Hall, Gymnasium and Swimming Pool, and Heating Plant. Since that time a small astronomical observatory and possibly other additions have been made. In addition to regular college work in which the degrees of Bachelor of Arts, Bachelor of Science, and Bachelor of Science in Education are granted there are normal courses for teachers, a department of music and expression, and commercial courses. On the date mentioned above there were 243 college students in residence, the total enrollment in all departments for the academic year of 1925-1926 being 464. The surroundings of this college are healthful and inspiring. Nature, in fact, has provided extraordinarily good opportunities for the study of the so-called natural sciences such as botany, biology, and geology. In the latter science, to which little if any present attention is paid in the college course, the outdoor facilities for field observation and training in the Tygart Valley and its environs are equalled by few other localities in the State.

West Virginia Children's Home.—The West Virginia Children's Home, established by act of the Legislature in 1909 and controlled by the State Board of Children's Guardians, is located in the Heavner Addition to Elkins which is north of Cut Hill. The physical plant consists of a two-story brick building and 28 to 30 acres of land. According to Mrs. Glenn Hersman, Nurse, who supplied information in the absense of Mrs. Jessica P. Lehman, Superintendent, the normal capacity of the plant is 35, there being 37 in residence in the autumn of 1926. Children of both sexes to 16 years of age are committed to the institution from various counties under State statutes. Children of tender age are taught in a school in the building and remain until nearly grown when homes are usually found for them in desirable families.

West Virginia Odd Fellows Home.—The West Virginia Odd Fellows Home, located on a slight eminence at the western edge of Elkins and completed in 1911, is a benevolent institution supported by the Odd Fellows Lodge of West Virginia for such children and adults as may be eligible under the rules of this order. The physical plant consists of a handsome three-story brick building surrounded by 300 acres of land with facilities for play and recreation. According to Mrs. C. P. White, wife of the Superintendent, this home was caring for 195 children and 10 adults in the autumn of 1926, there being little additional capacity.

Western Maryland Railway Shops.—In the autumn of 1926 the Elkins Shops of the Western Maryland Railway, located immediately north of Elkins Station and built in 1886 and later years, consisted of a roundhouse with stalls for making running repairs to engines, a five capacity back shop to overhaul engines, a machine shop, a blacksmith shop, and a car rebuilding shop with attached sawmill. According to W. K. Hosack, Contractor, under whose direction all this work was in progress by the contract system which had prevailed with this company since 1922, the car shop was occupied in making heavy running repairs to cars and in converting steel underframe gondolas into box cars, the output of rebuilt cars being 60 cars monthly. The working force consisted of 332 men of whom 100 were skilled mechanics.

On March 17, 1927, these shops were destroyed by fire. According to J. W. Broome, Secretary of the Western Maryland, no units of these shops have been rebuilt and no rebuilding is contemplated.

Elkins Refrigerator and Fixture Company.—The Elkins Refrigerator and Fixture Company, owned by the Schwenger-Klein Company of 5201 Dennison Avenue, Cleveland, Ohio, was established in 1906, its plant being located along the Durbin Branch of the Western Maryland Railway near the southern edge of Elkins. According to G. M. Right, Manager, the product consists of refrigerators for meat shops and stores and display cases and fixtures, the yearly capacity in 1926 being 600 coolers and 300 cases which go to the general trade. The plant is electrically driven by commercial power and when running at capacity employs 50 men of whom 30 are skilled laborers. About 50 per cent. of the lumber used is local and the double-strength window-glass needed is also manufactured in West Virginia but the plate glass mostly comes from the middle west.

Keystone Manufacturing Company.—The Keystone Manufacturing Company was established in 1912 with head offices in Elkins and works at the western edge of the city where both Western Maryland and Baltimore and Ohio Railroad connections are afforded. According to information supplied in the autumn of 1926 by W. H. Mason and R. B. Cody, of the general office, and by E. L. Wilfong, yard boss at the plant, this concern engages in manufacturing parquet flooring from oak and in surfacing and resawing as may be desired or required. The flooring capacity is 15,000 feet per day and the mill can also surface 30,000 feet, or two car-loads, per day, while the resawing varies according to requirements. Power is supplied by three 200-H. P. Houston, Stanwood and Gamble boilers, fired by coal from the Bower region of which an average of four cars per month are required. The working force included 58 men of whom 10 per cent. were skilled laborers.

Randolph Planing Mill Company.—The Randolph Planing Mill Company, located along Livingston Avenue, South Elkins, with a siding on the Western Maryland Railway, was established in 1917, having succeeded the Elkins Lumber and Manufacturing Company. According to O. H. Taylor, Treasurer and General Manager, this concern manufactures parquet flooring, interior trim, and table tops, and has a carpenter and cabinet shop in connection, approximately 4,000,000 feet of lumber per year being used. In 1926 there were 55 men employed, of whom 12 or 15 were skilled laborers. There are six dry kilns, accommodating 200,000 feet of lumber which must remain 10 to 14 days to complete the drying process to the required minimum of 5 per cent. moisture or less. Commercial power is partly used to run the plant but the company also has its own power equipment consisting of two 150-H. P. boilers and one 150-H. P. engine. Most of the raw lumber comes from the Allegheny Mountain region and the finished product goes to the general trade.

Kistler Leather Company.—The Elkins Tannery of the Kistler Leather Company with head office at 319 A Street, Boston, Mass., and works in South Elkins, with a Western Maryland Railway siding, was established between 1900 and 1905. According to C. T. Giles, Superintendent, who was interviewed in the autumn of 1926, this concern manufactures sole leather, its capacity being 600 hides per day. The raw hides are mostly obtained from South America and the product goes to the general trade. Oak and hemlock tan-bark is mostly used in the tanning process and the required lime is shipped from Maryland. The working force consists of 250 men of whom 100 are skilled laborers. Machinery is electrically driven with power made at the plant, there being two 100-H. P., one 200-H. P., and two 250-H. P. boilers.

Harding.

Harding, located on the eastern side of Tygart River one-half mile north of the mouth of Roaring Creek, was incorporated as a village in 1909, its principal industry being coal mining. In 1920 the population was 136.

Norton.

Norton, formerly known as Roaring Creek Junction, is situated on the western side of Tygart River slightly below the mouth of Roaring Creek, its principal industry being coal mining. In the general expansion period of 1917 to 1920 the town enjoyed a rapid growth and the population is estimated at 1,000. An inquiry concerning its date of incorporation and other data brought no reply.

Womelsdorf (Coalton).

Womelsdorf (Coalton Station and Post-Office) is a coal mining town situated on Roaring Creek three miles above its mouth and is served by a branch of the Coal & Coke (B. & O.) Railway. According to Stephen Womelsdorf, a former mayor, it was incorporated May 8, 1895. The West Virginia Legislative Hand Book gives its present population as 1500, the U. S. Census figures for 1920 having been 833. The population, according to the 1930 Census, is 373.

Montrose.

Montrose, situated in the valley of Leading Creek along the main line of the Western Maryland Railway, was incorporated October 12, 1895, according to W. D. Fisher, Mayor. Its population by actual count in 1927 was 117. The 1930 Census figure is 114.

Beverly.

Beverly, situated in Tygart Valley six miles south of Elkins, is one of the oldest communities in Randolph County. According to the West Virginia Legislative Hand Book and West Virginia Encyclopedia it was chartered December 16, 1790, by act of the General Assembly of Virginia, the charter having been amended in part in 1848, and a new charter having been received from the Legislature of West Virginia in 1882. By the census of 1920 its population was 442, but in 1927 it was estimated as 425 by James Baker, Mayor. The 1930 Census figure is 429. Prior to the advent of railroad transportation it was an important stopping point along the Staunton and Parkersburg Pike and for many years (until 1898) it was the county-seat of Randolph County. It is now served by a branch of the Western Maryland Railway and by the State highways. The town is the center of a rich agricultural district and in addition to its many historic features is surrounded by beautiful and inspiring mountain scenery.

Mill Creek.

Mill Creek, situated at the western side of Tygart Valley at the mouth of Mill Creek, was chartered by the Circuit Court May 16, 1903. In 1920 its population was 762 but according to G. C. Hamner, Mayor, it was estimated as 680 in 1927. The 1930 Census figure is 723. It is served by a branch of the Western Maryland Railway and by the Valley River Railroad, a narrow-gauge line extending southward up the valley. In addition to important farming interests it is the site of the lumber plant of the Wilson Lumber Company which will be later described. In 1929 a narrow-gauge railroad from Mill Creek westward up the creek of the same name was completed by John Nydegger and associates to serve new coal mines which should afford good business to the town.

Huttonsville.

Huttonsville, situated on the western side of Tygart Valley at the point where the Staunton and Parkersburg Pike turns southeastward to cross Cheat Mountain, was chartered as a town in 1890. In 1920 its population was 265 and in 1927 it was estimated as 260 by Major J. L. Ligget. The 1930 Census figure is 303. It is the southern terminus of the Huttonsville Branch of the Western Maryland Railway and is further served by the Valley River Railroad. Its present interests are largely agricultural and it is also an important State highway junction point.

Laneville.

Laneville, situated on Red Creek partly in Randolph and partly in Tucker County, was incorporated as a town in 1909 and for many years was an important lumber community, its population at one time having been estimated at 1,500. In 1920 it had declined to 103 and it is less than that figure at the present time. Its charter appears to have been abandoned although definite information is lacking.

Harman.

Harman, situated on Dry Fork of Cheat River, was once an incorporated village but according to local information the charter has been abandoned. In 1920 the population was 160 and since that time there has been little variation. The 1930 Census figure is 114. It is served by the Central

West Virginia and Southern Railroad and is located on the State route from Elkins to Franklin. Its interests are largely agricultural.

Job.

Job, situated on Dry Fork of Cheat River where the State route from Elkins to Franklin turns northward toward Harman, was incorporated as a village in 1907 according to Isaac White, Justice of the Peace. In 1920 its population was 177 and in 1927 it was 168 by actual count as reported by Mr. White. The 1930 Census figure is 61. It is served by the Central West Virginia and Southern Railroad, its interests being mainly agricultural.

Horton.

Horton is situated on Gandy Creek at the southern terminus of the Central West Virginia and Southern Railroad and the northern terminus of the Spears Lumber Company Railroad. For many years it has been the site of important lumber operations which have now greatly declined but which will be hereinafter described. According to Alston Vance, Acting Postmaster, its population in 1927 was estimated as 165.

VILLAGES.

Besides the cities and towns above described in detail there are numerous mining, lumber, and residential villages throughout the county, of which the following list gives the most important, exclusive of post-offices having only one or two families, their populations being estimated by postmasters or other reliable parties:

Randolph County Villages.

Village	Population 1927	Village	Population 1927
Adolph	115	Kerens	62
Alpena	82	Mabie	360
Bemis	175	Mingo	75
Bowden	70	Pickens	300
Dry Fork	50	Silica	82
Ellamore	550	Valley Head	170
Glady	198	Weaver	110
Helvetia	250	Whitmer (1930 Census)	265

CHAPTER II.

PHYSIOGRAPHY.

PHYSIOGRAPHIC CHANGES.

EVOLUTION OF MOUNTAIN FORMS.

The present land forms of Randolph County are the results of many complex forces which have acted through successive ages of geologic history. The surface rocks, aside from alluvial deposits, consist entirely of sandstones, shales, coals, and limestones. With the exception of coal the strata named were deposited under a moderate depth of water, but the presence of coal, accompanied by plant remains, indicates a flat swampy condition, the water being shallow enough to permit plant growth but at the same time deep enough to preserve mature vegetation from decay by oxidation. The occurrence of all this stratified material, comprising several thousand feet in approximately parallel layers, presupposes and requires that there must have been wide areas over which comparatively level conditions prevailed. The present forms, however, show that many changes have taken place since the time of the ancient, subaqueous plains. In the central belt of the Tygart Valley the rocks are no longer even approximately horizontal but have been warped into a huge arch the top of which has now been eroded to great depth. Farther east along Glady Fork and Middle Mountain a similar great uplift has occurred and still farther to the southeast, beyond Horton, the arching process is again repeated. In other parts of the county there are subsidiary folds of less consequence, with only gentle disturbance of the strata.

Full agreement has not yet been reached concerning the force, or forces, by which the uplifts of the Appalachian region, to which Randolph County belongs, have been caused. It is claimed by the exponents of the theory of isostasy, of whom there are many[1], that anomalies of gravity and the consequent readjustments of density, which tend to preserve

[1]See Bull. Geol. Soc. Am., Vol. 33, pp. 273-410, June, 1922, for a review of the theory by several authors, with references to many former publications.

the same weight for all equal columns of the earth's mass from its surface to its center regardless of their length, are the primary cause of stratigraphic displacements. Keith[2], who has carefully studied the Appalachian folds for many years, points out the utter inadequacy of the isostatic and all other previously advanced theories to account for the immense overthrusts that exist in these mountains at many localities. He suggests instead, with an assemblage of evidence and logic that appears overwhelming, that the principal lateral movement was caused by batholiths of granitic magma which were extruded in liquid form mainly in post-Carboniferous time, in the Piedmont belt east of and parallel to the present mountain chains, and which are most noticeable in the localities opposite the greatest overthrusts, and all of which may be connected by subsurface flows into a granitic mass equal in length to the mountain system. It is apparent from his maps that the greatest outward, or northwestward, deflection of the mountains from their general course has occurred opposite the greatest masses of intrusive material and also that the greatest overthrusts have taken place under similar conditions. In southern West Virginia this northward deflection of the mountains with consequent overthrusts is quite apparent and probably due to the great intrusions in the Carolinas and Georgia. Randolph County, on the contrary, lies opposite no great intrusives and hence there is no unusual northwestward bulging and there are no overthrusts. The intrusives which lie to the eastward are of only secondary magnitude and hence the Randolph County arches are likewise of secondary rank without overturning or overthrusting.

In addition to the great structural changes which have been the primary cause of mountain building and which, in many cases, have elevated old land surfaces to great heights above the level of the ancient Appalachian Sea where they were originally deposited, there has been a vast amount of surface erosion. This action, caused mainly by rain water in conjunction with natural disintegration of the rocks, has cut great hollows through the uplifted and warped surfaces of old plains and has, at the same time, greatly reduced the heights of the mountains. It is clear, therefore, that two great agencies were concerned in the development of the present mountain forms, the first being the forces of lateral thrust and uplift, whatever they may have been, and the second the force of gravity, acting through the medium of erosion and tending to tear down the heights.

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[2]Arthur Keith, Outlines of Appalachian Structure, Bull. Geol. Soc. Am., Vol. 34, pp. 309-380; June, 1923.

In Randolph County a very conspicuous example of this combined action may be seen in Tygart Valley where the uplifting agencies created the Deer Park Anticline, or arch, which is practically coincident with the valley in alignment and which, without interference, should have created a huge mountain range perhaps 7,000 feet above the present valley floor at Elkins or approximately 9,000 feet above sea-level. It is neither apparent nor probable, however, that such was the case. Before uplifting of the ancient land surface began Tygart River apparently occupied much the same position as now and was able to preserve its approximate channel through the centuries and to cut through the upward bending and broken rocks as fast as uplift took place, finally reaching the soft Devonian shales in which erosion was comparatively easy. Instead of being a mountain, therefore, the Tygart Valley is an eroded anticline and the escarpments of hard Pottsville rocks along Rich Mountain to the westward and Cheat Mountain to the eastward are merely fragments of the great range which might have existed had there been no erosion.

Previous geologic work by many investigators has shown that the first folding which formed the present Appalachian System, of which Randolph County is a part, took place at the close of the Permian Period. There are no rocks of this type now left in the county although they exist in great quantity in the western part of the State; and there is no positive evidence to show that they ever did exist in quantity in the county but it is known that certain areas of Permian are still preserved along the North Potomac (Georges Creek) Basin farther north in Maryland and Pennsylvania and hence it is probable that these beds may have extended over all or part of Randolph County.

The erosive action of mountain streams, begun in the Permian Period through many thousands, or perhaps millions, of years, until at the end of the Triassic Period, as now believed, the Appalachian summits had reached an almost level, or peneplain, condition, sloping gently westward toward the Mississippi Basin and broken only by occasional pinnacles of more resistant rocks.

During the late Jurassic Period lateral forces again became active and raised the peneplain into a second mountain system, exposing still deeper formations of the rock column, which were attacked again by the rains of the Cretaceous Period, bringing them down to a second peneplain.

In the late Cretaceous or early Tertiary Period another series of foldings created a third range of mountains, located in the same region or slightly northwest of the two previous ones, followed by subsequent erosion. A further cycle of uplift took place in late Tertiary time, making a fourth range of mountains, this latter range, or series of ranges, composing the Appalachian System that now exists. The present geologic period being one of erosion, the mountains for the fourth time are wearing down to a lower level.

In its geographic relations Randolph County belongs mainly in the Cumberland Plateau, or Western Division, of the Appalachian Province, a general description of which may be found in many publications[3].

A more recent publication by Abbe[4] divides the Appalachian Province into four subdivisions, named from east to west the Blue Ridge, the Great Valley, the Allegheny Ridges, and the Allegheny Plateau. These four subdivisions were named to apply to the physiography of Maryland but the same forms extend into West Virginia and provide a more logical classification of the topography than the older nomenclature, so that they are herein adopted.

The Blue Ridge subdivision includes the Blue Ridge and Catoctin Mountains and intervening territory. The Great Valley subdivision consists of low-lying limestone lands from the Blue Ridge west to North Mountain, Berkeley County. The Allegheny Ridges subdivision extends westward to the Allegheny Front. The Allegheny Plateau subdivision includes all the area from.the Allegheny Front westward to the limits of the Appalachian Province.

It is evident from the above descriptions that Randolph County lies wholly within the Allegheny Plateau subdivision, since its southeastern boundary, next to Pendleton County, is formed by the Allegheny Mountain which is regarded by some authors as a southward extension of the Allegheny Front of Mineral and Grant Counties but which at some points appears to be even slightly west of the true Allegheny Front. In the Allegheny Plateau subdivision the land forms have been studied by many geologists. In general the topography consists of the warped and eroded remnants of four peneplains, in addition to certain monadnocks, or hillocks, which extend above them and certain river terraces which are of more recent origin. These features are hereinafter discussed.

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[3]See Darton and Taff, Piedmont Folio, No. 28, U. S. Geol. Survey (1896); also N. H. Darton, Franklin Folio, No. 32 (1896); also Taff and Brooks, Buckhannon Folio, No. 34 (1896).

[4]Cleveland Abbe, Jr., Maryland Weather Service, Vol. I, Plate III, opposite page 72; 1899.

PLATE III.—View from hill north of Elkins reservoir looking west toward Davis and Elkins College and northern portion of Elkins city. Foreground topography is Portage. Gap at extreme middle rear is where Tygart River cuts through Rich Mountain (left) and Laurel Ridge (right), both capped by Pottsville and followed between by Mississippian and Devonian slopes. (Photo. by E. E. Harris.)

PLATE IV.—Randolph County Court-House at Elkins. Built from local Pottsville sandstone. (Photo. by E. E. Harris.)

PLATE V.—Looking up Tygart River from point 0.9 mile west of Harding, showing great boulders from Homewood and Upper Connoquenessing Sandstone cliffs. Topography of Allegheny and Pottsville Series.

PLATE VI.—West Virginia Coal & Coke Co. No. 1 Mine (Nos. 15 and 16 on Map II), at Coalton, looking toward south opening.

PENEPLAINS.

Schooley Peneplain.

The Schooley Peneplain, named by W. M. Davis from its occurrence on Schooley Mountain, Morris County, New Jersey, is by far the most important and long continued of all the ancient plains of the Appalachian Province. Believed by many to have been developed during the Cretaceous Period, the statement is made by Abbe[5] that Triassic sediments occur at its type locality while in other regions Jurassic rocks have been deposited on it, indicating that it should be attributed to Jurassic time, in contrast to the earlier belief which appears to have been based on a mistaken correlation. It should be stated, however, that full agreement as to the age of this plain does not exist. Certain authors even hold the opinion that it is even younger than Cretaceous time. Whatever may have been its actual age, remnants of this great plain, much warped by later folding and often cut into mere ribbons by erosion, still exist from the Coastal Plain westward to the Ohio River and beyond.

Monadnocks.—The presence of certain monadnocks, or hillocks, which rise a few hundred feet above the general surface of the Schooley Peneplain, has already been mentioned. These, if clearly recognized as above the Schooley, apparently represent a somewhat older land surface which may be the Kittatinny Peneplain of Pennsylvania. These monadnocks are so few and uncertain in Randolph County, however, that they can scarcely be classified as a separate plain. On Allegheny Mountain it is possible that the westward promontory of the Roaring Plains four miles northeast of Harman, with an elevation of 4,760 feet, belongs above the Schooley. On Little Middle Mountain, Pharis Knob, at 4,674 feet, is probably a monadnock; and on Rich Mountain west of Dry Fork, Haines Knob at 4,272 feet appears to be a remnant. On Middle Mountain monadnocks are not evident but on Shavers Mountain and Back Allegheny, which together form a connected range, the conspicuous high tops from north to south are Big Knob, 3,825 feet; Spruce Knob, 3,815 feet; certain unnamed knobs farther south at 4,620, 4,646, and 4,790 feet; and Bald Knob in Pocahontas County, 4,842 feet. On Cheat Mountain the outstanding tops from north to south are Bickle Knob, 4,008 feet; Pond Lick Mountain, 4,005 feet; Barton Knob, 4,433 feet; Crouch Knob, 4,562 feet;

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[5]Cleveland Abbe, Maryland Weather Service, Vol. I, pp. 120-121; 1899.

Snyder Knob, 4,612 feet; and Mace Knob in the edge of Pocahontas, 4,705 feet.

West of Tygart Valley there are no conspicuous tops on Laurel Ridge but on Rich Mountain Lonetree Knob at 3,563 feet may be a monadnock and on Turkeybone Mountain south of Pickens there are three pinnacles, including the triangulation point and another unnamed knob at 3,650 feet and Bee Knob at 3,600 feet, which are clearly of pre-Schooley age.

General Surface of the Schooley Peneplain.—In early Triassic time before the uplifts which have been mentioned began, the Schooley surface was probably a fairly smooth plain sloping gently westward toward the Ohio River region and broken only by such monadnocks as have been mentioned. Most of the rivers were sluggish and unable to cut deep channels or to remove obstructions. With the Jurassic uplift this old plain was elevated to great heights along the central part of the Appalachian System, its slope on the east descending toward the coastal plain region with a gradually flattening profile and its slope on the west having a somewhat similar descent toward the Ohio and Mississippi region. The general surface, however, was warped rather than smooth. The rivers, instead of being base-leveled and powerless to erode strata, became swift, especially in the mountain region, and began their work of destroying the uplifted plain.

At present, and as modified by subsequent uplifts and erosion, the Schooley Peneplain is now evidenced by the long ridges of Allegheny Mountain with a general height of 4,000 feet and upwards; by Rich Mountain west of Dry Fork and Little Middle Mountain with a similar height; by Middle Mountain at 3,500 to 3,700 feet; by Shavers Mountain and Back Allegheny with general elevations of 3,700 to 4,500 feet, there being a gradual increase in height from north to south; by Laurel Ridge and Rich Mountain west of Tygart River with heights of 3,000 to 3,500 feet; by Point Mountain and Gauley Mountains with heights of 3,700 to 4,000 feet; and still farther northwest by the gradually descending ridges west of Rich Mountain with summits of about 2,500 feet along the Barbour and Upshur County lines.

Weverton Peneplain.

The Weverton Peneplain, named from Weverton; Washington County, Maryland, and classified by members of the Survey of that State as being of late Jurassic or possibly early Cretaceous age, and having a general elevation of 400 to 500 feet less than the Schooley, is also represented in Randolph County. In the eastern portion it may be recognized in many wind-gaps and high spurs or shoulders of Allegheny Mountain, Little Middle Mountain, and Rich Mountain, at elevations of 3,500 feet and upwards; and by spurs and gaps of Middle Mountain at 3,000 feet or less. On Shavers Mountain and Back Allegheny it is witnessed by gaps and high spurs at 3,200 to 3,800 feet. On the western side of Cheat Mountain, Elliott Ridge at 3,200 to 3,300 feet, Middle Ridge at 3,000 feet, Chestnut Ridge at about 3,300 feet, and Swecker Ridge at 3,300 to 3,400 feet may all represent this old plain. West of Tygart Valley there are many conspicuous foot-hills of Laurel Ridge and Rich Mountain, standing 400 to 500 feet below the general ridge level and apparently marking the Weverton. West of Rich Mountain it may also be noted at many points.

Harrisburg Peneplain.

The Harrisburg Peneplain, named from Harrisburg, Dauphin County, Pennsylvania, and believed to be of early Tertiary age, since deposits of late Tertiary rocks have been found resting upon it, and having a general elevation of 400 feet less than the Weverton and 900 to 1,000 feet less than the Schooley, is much evident in certain parts of Randolph County. On Allegheny Mountain and Rich Mountain west of Dry Fork, it is mainly noticeable in certain low spurs or shelves, including the belt of smooth farming land west of the latter range. East of Shavers Mountain it is again plainly visible in the long stretch of limestone lands from Mylius School to Alpena and Glady with elevations of 2,600 to 2,800 feet. West of Cheat Mountain there are dozens of low spurs at 2,700 to 3,000 feet which mark it, and in the Mingo Flats at about 3,000 feet it is conspicuously preserved. West of Tygart Valley it is again evidenced by many low spurs and upland valleys in the foot-hills of Laurel Ridge and Rich Mountain. Still farther west it may be observed in an upland valley northeast of Harding and in certain low plateau lands in the vicinity of Norton, Coalton, and Mabie, all having a general elevation of about 2,200 feet.

Somerville Peneplain.

The Somerville Peneplain, so named from its occurrence near Somerville, Somerset County, New Jersey, believed to be of late Tertiary age and having a general elevation of only about 100 feet less than the Harrisburg, may best be observed in the lower foot-hills of Cheat Mountain and Rich

Mountain where these eminences jut outward toward the Tygart River.

RIVER TERRACES.

Evidence of former drainage levels higher than the present channels of the major streams of Randolph County is abundant. The following tables give in condensed form the locations and other data obtained in the field concerning these deposits along Tygart River, Shavers Fork of Cheat River, Dry Fork of Cheat River, and Elk River. Some of these observations were made outside of Randolph County and have been previously published by the writer in the Tucker and Webster County Reports of the Survey, but they are herein republished to afford intelligent consideration of the subject:

Terrace Deposits Along Tygart River.

LOCALITY	EVIDENCE	Elevation. Top. Feet.	Height of Top Above Stream. Feet.	Name of Terrace.
State road, 1.5 mi. N. W. of Elkins and S. of Leading Creek	Boulders	1970	70	Second
Road, 0.6 mi. S. E. of Buxton	Clay and pebbles	2000	100	Second
Leading Creek, near Read Station	Flattened ridges	1980	70	Second
Sullivan, 0.2 mi. S. W. of	Boulders and clay	1995	85	Second
Elkins	Sand	1920	16	Flood-plain
Sullivan, 0.5 mi. E. of	Sand and gravel	1925	20	Flood-plain
Files Creek, 2 mi. S. E. of Beverly	Gravel	2065	125	Third
Ed. Baker residence, 0.5 mi. S. of Beverly	Boulders	2000	60	Second
Road, 1.8 mi. N. E. of Burnt Bridge	Boulders and clay	2100	150	Third
Bottom, 0.5 mi. N. E. of Dailey	Clay	1972	27	First
Dailey, 0.5 mi. N. E. of	Sand	1952	7	Flood-plain
Road, 0.5 mi. N. W. of Dailey	Clay	2010	60	Second
Road, 0.3 mi. W. of Dailey	Boulders and clay	2000	50	Second
Road, 0.7 mi. S. W. of Dailey	Boulders and clay	2010	60	Second
Road, 0.8 mi. S. of Valley Bend	Boulders and clay	2135	75	Second
Road, 1.8 mi. S. of Huttonsville	Boulders and clay	2150	120	Third
Road, 2.4 mi. S. of Huttonsville	Boulders and clay	2165	135	Third
Poundmill Run, 0.3 mi. S. of	Smooth point	2165	90	Second
Elkwater, 2 mi. N. E. of	Bouuders and Clay	2135	85	Second
Elkwater, 1.3 mi. N. E. of	Boulders	2115	65	Second
Elkwater, 0.4 mi. S. W. of	Boulders and clay	2195	55	Second
Spangler, 0.6 mi. N. W. of	Boulders	2210	35	First
Valley Head	Boulders	2388	8	Flood-plain

Terrace Deposits Along Shavers Fork of Cheat River.

LOCALITY	EVIDENCE	Elevation. Top. Feet.	Height of Top Above Stream. Feet.	Name of Terrace.
Parsons	Sand	1655	15	Flood-plain
Parsons, W. of R. R. Sta.	Sand and gravel	1710	70	Second
Parsons, W. of R. R. Sta.	Sand and gravel	1810	170	Third
Parsons, W. of R. R. Sta.	Sand and gravel	1860	220	Fourth
Parsons, W. of R. R. Sta.	Smooth bench	1980	340	Fifth
Road, 0.5 mi. S. W. of Porterwood	Boulders	1755	65	Second
Stonelick Run, near mouth	Clay and gravel	1815	65	Second
Stonelick Run, 1.1 mi. S. of	Clay and boulders	1815	65	Second
Pettit, 0.4 mi. N. E. of	Rounded gap	1945	145	Third
Road, 0.8 mi. S. of Canfield School	Boulders and clay	2185	75	Second
Road, 1 mi. S. of Canfield School	Boulders and clay	2145	45	First
Meadows Station	Sand	2165	10	Flood-plain
Bowden, 0.2 mi. S. E. of	Rounded point	2415	215	Fourth
Bowden, 0.2 mi. S. E. of	Boulders	2360	160	Third
Bowden	Sand and boulders	2210	10	Flood-plain
Montes	Sand and boulders	2410	10	Flood-plain

Terrace Deposits Along Dry Fork of Cheat River.

LOCALITY	EVIDENCE	Elevation. Top. Feet.	Height of Top Above Stream. Feet.	Name of Terrace.
Parsons	Sand and boulders	1655	15	Flood-plain
Parsons, just S. E. of	Boulders and clay	1750	110	Second
Parsons, just S. E. of	Boulders and clay	1830	190	Third
Parsons, just S. E. of	Boulders and clay	1860	220	Fourth
Parsons, 0.4 mi. E. of	Boulders	1820	190	Third
Parsons, 0.5 mi. N. E. of	Boulders	1800	170	Third
Roaring Run, 0.2 mi. W. of	Boulders	1805	145	Third
Jenningston	Sand and gravel	2020	10	Flood-plain
Middle Mt. road, 0.6 mi. N. E. of Jenningston	Boulders	2130	120	Third
Middle Mt. road, 0.6 mi. N. E. of Jenningston	Sand and gravel	2225	215	Fourth
Middle Mt. road, 0.6 mi. N. E. of Jenningston	Sand and gravel	2295	270	Fifth
Road, 0.7 mi. N. E. of Dry Fork P. O.	Sand and gravel	2370	195	Third
Road, 0.5 mi. N. E. of Dry Fork P. O.	Sand and gravel	2265	90	Second
Road 0.2 mi. S. E. of Dry Fork P. O.	Boulders	2220	45	First
Road, 0.7 mi. E. of Dry Fork P. O.	Boulders	2340	165	Third
Job	Sand and boulders	2575	6	Flood-plain
Gandy bridge, 1.3 mi. N. W. of Whitmer	Sand and gravel	2700	6	Flood-plain

Terrace Deposits Along Elk River.

LOCALITY	EVIDENCE	Elevation. Top. Feet.	Height of Top Above Stream. Feet.	Name of Terrace.
Webster Springs, at cemetery	Unrecorded	1630	190	Fourth
Low gap just west of Mill Run	Unrecorded	1850	175	Third
Valley Fork, 0.8 mi. S. of	Boulders	2400	100	Second
Valley Fork, 1 mi. S. of	Boulders	2450	150	Third
Swacker School, 0.3 mi. N. W. of	Boulders	2610	210	Fourth
Randolph-Pocahontas line, 0.2 mi. N. of	Sand and gravel	2495	15	Flood-plain

From the above tables it is evident that, in addition to the low flood-plains which are seldom more than 10 or 15 feet above present water-level, there are at least five distinct terraces along the rivers of the county which may be summarized in descending order as follows:

Fifth Terrace ---- --------	275 to 350 feet above the rivers.
Fourth Terrace -----------	200 to 250 feet above the rivers.
Third Terrace -------------	120 to 175 feet above the rivers.
Second Terrace -----------	75 to 90 feet above the rivers.
First Terrace -------------	25 to 50 feet above the rivers.

In the tables it is apparent that local evidence along Tygart River reveals the presence of the First, Second, and Third Terraces; on Shavers Fork of Cheat all five terraces were noted; on Dry Fork of Cheat all were observed; and on Elk River only the Second, Third, and Fourth are recorded.

All these rivers reach the Ohio and hence the relationship of their terraces to those of the parent stream are of much interest. The Ohio River terraces, five in number, were studied and described by White[6], their presence across the entire western front of West Virginia being now well known. On tributary streams like the Monongahela the terraces were studied to some extent by White and in more recent years by Hennen, Krebs, and Reger, the whole subject having been reviewed by the latter[7] in a comparatively recent publication. Evidence was presented in the latter to show that the five Ohio terraces of White may be traced for long distances up these tributary streams, preserving the same approximate levels above drainage as along the Ohio, and also to show that on New River and its tributaries there are at least two more terraces at higher levels, named as the Sixth and Seventh Terraces. In Tucker County, which adjoins Randolph on the north, a record of terraces has been previously made by the writer[8] but at that time the general study of the terraces was far less advanced than at present. In Tucker the first terrace noted occurs at a level of 60 to 90 feet above Cheat River but it is now apparent that this should rather be called the Second Terrace. The fifth level named for Cheat River in the same county is 330 to 340 feet above water-level but it is now rather apparent that this belongs near the approximate level of the Sixth Terrace as classified on New River. Corresponding changes are, of course, required on the intermediate terraces described in the Tucker Report.

[6]I. C. White, Sec. Geol. Survey of Pa., Rept. Q, p. 10; 1878.

[7]David B. Reger, Mercer, Monroe and Summers Rept., pp. 64-70; 1926.

[8]David B. Reger, Tucker Rept., W. Va. Geol. Survey, pp. 79-82; 1923.

With the above statements in mind it is now evident that the Monongahela tributaries in Tucker and Randolph Counties show six of the seven terraces noted on New River. It is to be regretted that the Seventh was not observed but a further search would probably reveal it at a level of 400 to 500 feet above the rivers.

The close harmony of terraces on all the major tributaries of the Ohio in the State leads to the belief that a common cause was responsible for them all. Those of the Ohio have been attributed by Dr. White to varying levels of the ice gorge near Beaver, Pennsylvania, resulting in unequal rates of erosion farther upstream. All later evidence would appear to show that the influence of this great ice dam, which turned the waters of the Ohio southward from the St. Lawrence drainage basin toward that of the Mississippi, was felt for many hundreds of miles from its actual site, although still water, from this cause, could not have existed at elevations clearly above any probable height of the dam. There must have been, however, successive stages when erosion along the lower waters almost entirely ceased, followed by other stages when a break or partial destruction of the dam created wild currents which rapidly reduced the profile of the Ohio bottoms and its tributaries until practical equilibrium and a normal rate of erosion was restored for an interval in which the dam stood practically intact, only to be followed by other breaks and other cycles of erosion. If such a theory be accepted it would follow that the terraces of the Monongahela and Great Kanawha, and hence those of the tributaries in Randolph County are of Pleistocene age.

PRESENT TOPOGRAPHIC FEATURES.

GENERAL DESCRIPTION.

No general statement is applicable to the topography of Randolph County. In that portion west of the western base of Rich Mountain which is west of Tygart Valley, the present topographic effects may be ascribable almost entirely to stream erosion which has gradually cut into ribbons the ancient surface of the Schooley Peneplain, producing a labyrinth of narrow, V-shaped valleys, the comparative youth of which is indicated by the absence at most points of wide bottoms or stream meanders other than those inherited from a previous epoch. In some localities of this territory there are occasional small table-lands, generally upheld and preserved by hard sandstones of the Pottsville Series, and in the northern part of this area the comparatively gentle topography of the Allegheny Series is preserved entirely above the Pottsville gorges. From the vicinity of Cassity southward, however, steep slopes and ridges which vary from 500 to 1,000 feet in height are the rule. Still farther south, in the valley of Elk River erosion has gone to a depth of 1,500 to 2,000 feet below the Schooley Peneplain, the slopes being extremely steep but not usually precipitous.

In that portion of Tygart Valley above and south of Elkins and in Leading Creek, which empties into Tygart River from the north just below Elkins and which may be considered a northward extension of the valley, the combined effect of uplift and erosion is more evident. As previously stated, the valley is anticlinal and has been deeply eroded into the soft Upper Devonian shales. On the west, Laurel Ridge and Rich Mountain exhibit an almost continuous escarpment of hard Pottsville rocks, interrupted only by the gap where Tygart River cuts them in two below Elkins; and down the eastern sides of these ranges there are successive steep slopes, small upland shelves or valleys, and turret-like hillocks, all due in large part to the varying hardness of the strata which are successively exposed. On the east a similar but generally higher escarpment exists along Cheat Mountain, the western slope of which exhibits a descending profile as above described. The valley itself, from Elkins southward to Valley Head and beyond, and from the mouth of Leading Creek northward to Montrose, is that of a mature base-leveled country, both the river and the creek being sluggish and having wide bottoms in which the streams meander. Toward the head of Leading Creek, however, there are some low parallel ridges within the valley, but along Tygart River such conditions do not exist.

On Shavers Fork of Cheat River the topography is varied but uniformly rough. Below Meadows and Lumber it exhibits on the west the highly dissected ridges common to the Upper Devonian outcrops but on the east there is a high Pottsville escarpment along McGowan Mountain and the mountain slope is similar to that described on either side of Tygart Valley. Between Meadows and Bowden the river cuts nearly 2,000 feet through the Pottsville and Mississippian sediments, exhibiting a topographic sequence much like that along Elk River. From Bowden southward to the head of the river the valley is almost coincident with a structural syncline which to some extent is reflected in the topography. From Bowden to Bemis and Cheat Junction the mountainsides are extremely rough and precipitous but above Cheat Junction for many miles the channel has scarcely gone below the Pottsville and there are no steep valley walls. Above Cheat Bridge, however, the southward rise of the rocks has permitted the river to cut rather deeply into the soft Mauch Chunk shales. On the entire stretch of this river from Bemis to its head the slopes are littered with a vast agglomeration of Pottsville debris and there is scarcely an acre of land that would be susceptible to agriculture or even grazing. The same condition prevails along Otter Creek, heading northeast of Bowden and flowing northeastward along the approximate axis of the same syncline which extends up Shavers Fork.

The eastern slopes of Shavers Mountain and Back Allegheny are crowned at the top by escarpments of Pottsville, followed below by most of the formations which outcrop on either side of Tygart Valley and hence present a similar topographic profile, except that the Chemung and Portage Series of the Devonian are mostly below drainage and the sharp, narrow ridges typical of them are missing.

In the territory embracing Glady Fork, Middle Mountain, and Laurel Fork most of the outcrops are Catskill, together with certain small areas of Chemung. The Blackwater Anticline passes through this region but is reflected scarcely at all in the topography which mainly consists of weak, rounded ridges typical of the Catskill Series.

Between Laurel Fork and Dry Fork the main topographic feature is Rich Mountain, toward the northern end of which there are a few high peaks crowned by Pottsville. The remainder of the ridge is covered by Mauch Chunk shales, being generally smooth and rounded at the top, followed below by fairly smooth slopes. On the western side and at the northern end of the mountain there is a wide shelf of Greenbrier held up by hard ledges of Pocono and Catskill. On the east the Pocono outcrops extend southward only a short distance above Harman and hence, farther south, the characteristic Pocono-Greenbrier shelf is missing.

Still farther south Little Middle Mountain, which lies between Dry Fork and Gandy Creek, is also covered by Mauch Chunk sediments, its summit and western slope being similar to that of Rich Mountain. On the eastern side, however, the rising geologic structure brings the Pocono above drainage and causes the reappearance of the familiar Pocono-Greenbrier shelf.

South of Little Middle Mountain are the sinks of Gandy Creek, comprising a small area around Osceola where a large sink-hole has developed in the Greenbrier Series. Gandy Creek flows through the sink but escapes by a subterranean tunnel at the northern end, although its channel is not deep enough to afford good drainage for the major portion of the sink.

Dry Fork of Cheat River cuts an extremely deep valley, being at some points more than 2,000 feet below the level of the Schooley Peneplain. The topography of Rich Mountain, lying west of the stream, has already been described. From the Tucker County line southward to Harman there is a wide Pocono-Greenbrier shelf which also extends eastward up Red Creek toward Laneville. Above this shelf is a long slope of Mauch Chunk shales, crowned by hard layers of Pottsville which is the main element tending to hold up the high plateau of the Roaring Plains south of Laneville, although higher formations of the Pennsylvanian System cover part of this territory. From Harman southward the structure east of Dry Fork is rising rapidly southeastward toward Allegheny Mountain and soon carries the Pottsville so high that it covers only certain tops between Harman and Job and south of Job has been entirely eroded. In this region of isolated Pottsville outcrops there are deep mountain gaps cut into the softer Mauch Chunk.

South of Job the structure rises consistently toward Allegheny Mountain and is plainly reflected in the topography as shown by the transverse ridges in the vicinity of Whitmer, Horton, and Osceola. North of Whitmer these short ridges are mainly formed by Mississippian formations but farther south most of the outcrops are Catskill and the slopes are often rough and precipitous owing to the heavy sandstone ledges which usually appear when this series becomes thick as is the case in southern Randolph County.

MOUNTAINS.

Laurel Ridge.—Laurel Ridge, forming a sector of the series of escarpments which lie west of the Deer Park Anticline, is limited by name to the stretch lying between the gap of Cheat River west of Rowlesburg, Preston County, and the gap of Tygart River, Randolph County, a distance of approximately 32 miles. From the common corner of Tucker, Barbour, and Randolph Counties it mostly forms the line between the latter two, except that the line turns westward slightly north of the gap of Tygart River. From the county corner mentioned southward to the gap the length of this ridge is 21 miles. Near the northern end of Randolph County it is entirely cut in two by Brushy Fork of Teter Creek which flows westward into Barbour County but to the southward the gaps are uniformly high, usually 2,700 feet or more above sea-level. Above these gaps the summits frequently rise to 3,000 feet or more, the apparent maximum being 3,300 feet. This ridge is asymmetrical, its western slope being comparatively gentle and reflecting the dipping structure while its eastern side is uniformly steeper with many low foot-hills toward the base.

Rich Mountain (West of Tygart Valley).—Rich Mountain, west of Tygart Valley, is a southward continuation of Laurel Ridge, starting just south of the gap of Tygart River below Elkins and extending southward for more than 25 miles until it merges in the general high plateau southeast of Pickens. This range is quite similar to Laurel Ridge, being a further extension of the same geologic structure with gentle slopes toward the west and steeper topography and many foot-hills toward the east. From Tygart River the sea-level elevation of Rich Mountain becomes gradually greater toward the south, the general summits varying from 3,330 feet at the north to 3,900 feet at Whitman Knob at the extreme south. In this same distance the gaps are uniformly high, varying from about 3,000 feet at the north to 3,500 feet at the south. The hard rocks of the Pottsville Series are almost wholly responsible for the preservation of this high ridge.

Point Mountain.—Point Mountain starts west of Monterville and south of the southern end of Rich Mountain, with which it is directly connected by a plateau area, and extends westward between Elk River and Back Fork of Elk to Webster Springs, Webster County, approximately 17 miles, of which only five miles are in Randolph County. It is covered entirely by Pottsville rocks but in contrast to the rough topography of Laurel Ridge and Rich Mountain it is comparatively smooth and its fairly broad summit has mostly been cleared and put under cultivation making one of the highest farming sections of the State. Its highest summit of 4,000 feet is near the eastern end in Randolph County, there being a gradual westward descent to 3,000 feet just east of Webster Springs. Along this mountain the geologic structure dips to the northwestward and this is reflected to some extent in the topographic slopes, those to the north being not quite so abrupt as those at the south where the descent into the Elk Valley is extremely steep but usually not precipitous.

Turkeybone Mountain.—Turkeybone Mountain is the name applied to a short sector of a ridge starting near Palace Valley, Upshur County, and extending southward between two forks of Buckhannon River to the cross ridge southeast of Pickens and thence southwestward to the forks of Sugar Creek and Little Sugar Creek, Webster County, a distance of about 16 miles of which approximately 12 miles are in Randolph County. This ridge is not a structural uplift, its preservation being entirely due to the presence of hard ledges of the Pottsville. Its summit, at the triangulation point southeast of Pickens, is 3,700 feet.

Gauley Mountain.—Gauley Mountain is a high, plateau-like ridge starting northwest of Edray, Pocahontas County, and extending northward to the bend of Elk River east of Whitaker Falls, Randolph County, approximately 14 miles, of which about six miles are in Randolph. Generally its position is directly west of Elk River and Old Field Fork of the same. Its most northern summit has an elevation of 3,900 feet but at Spruce Mountain in Pocahontas County, it rises to 4,710 feet. All of the northern sector in Randolph is crowned by hard Pottsville rocks, with very steep slopes downward to Elk River.

Elk Mountain.—Elk Mountain is an isolated eminence in southern Randolph County, lying east of Elk River, south of Valley Fork of the same, and west of the Mingo Flats. It consists of two high summits, the northern of which is 4,300 feet and the southern of which is 4,350 feet above sea-level and therefore more than 2,000 feet above Elk River at Valley Fork. These two summits are preserved by a hard mantle of Pottsville rocks. Mingo Knob to the southward is an extension of the same topography but has retained no Pottsville and is cut off from Elk Mountain by a deep divide eroded nearly through the Mauch Chunk.

Cheat Mountain.—Cheat Mountain begins at the Tucker-Randolph County line northeast of Kerens and extends southward approximately 48 miles entirely through the length of Randolph, its southern end being at the Thorny Flat at the head of Shavers Fork, Pocahontas County, and the last six miles of its length being in that county. At the northern end it is for eight or ten miles the dividing ridge between Shavers Fork of Cheat River and Leading Creek of Tygart River, being mainly composed of sharply folded Chemung sediments and therefore exhibiting the steep slopes and extremely narrow ridge tops typical of this series, with elevations that are seldom above 3,000 feet. In its structural associations this sector of the range is not allied to the main character farther south, being merely a fortuitous offshoot to which the name of Cheat Mountain has been unfortunately applied. More properly the main bulk of Cheat Mountain is a southward extension of Backbone Mountain and McGowan Mountain, all of which comprise the same structure and are merely cut into different topographic sectors by the gaps of Dry Fork above Parsons and Shavers Fork below Bowden.

From the region where Shavers Fork suddenly turns westward from Bowden and cuts a four-mile gap through the McGowan-Cheat range, the main Cheat Mountain southward to the Pocahontas County line forms the dividing ridge between Tygart River and Shavers Fork. Generally its summits are formed by escarpments of hard Pottsville rocks dipping eastward, but many of the gaps are eroded into the Mauch Chunk shales and toward the south the river tributaries have cut deep depressions, some of which have almost become water-gaps. The summits are uniformly high, Pond Lick Mountain south of the gap of Shavers Fork being 4,005 feet, Barton Knob 4,433 feet, and an unnamed summit in Pocahontas County southeast of Mace being 4,830 feet. On the west the descent toward the waters of Tygart River is generally steep but usually broken by the Pocono-Greenbrier and other benches. On the east the descent is less abrupt and there is less relief, as the valley of Shavers Fork above Bemis is a high, synclinal shelf.

McGowan Mountain.—McGowan Mountain, structurally allied with Backbone and Cheat Mountains, starts at the gap of Dry Fork of Cheat River southeast of Parsons, Tucker County, and extends southwestward ten or twelve miles to the gap of Shavers Fork, Randolph County, forming the divide between Shavers Fork and Otter Creek. Approximately eight miles of its length are in Randolph County. It is mainly formed by escarpments of Pottsville dipping southeastward toward the North Potomac (Georges Creek) Syncline, with gaps cut into the softer Mauch Chunk. The most northern summit next to Dry Fork is 3,554 feet, and Bickle Knob next to the gap of Shavers Fork is 4,008 feet, with intermediate tops occurring between these figures and with gaps at considerably lower elevations. In harmony with the structure the western slopes are steep but on the east they are less abrupt. In general, however, this mountain is rough and several of its eastern transverse ridges exhibit heavy Pottsville cliffs.

Shavers Mountain and Back Allegheny Mountain.—Shavers and Back Allegheny Mountains, which comprise a single range partly cut in two by a wind-gap east of Cheat Bridge, start at Dry Fork of Cheat just below Gladwin, Tucker County, and extend southwestward approximately 50 miles to the Thorny Flat in Pocahontas County west of Cass, the portion north of Cheat Bridge being known as Shavers and that to the southward as Back Allegheny. Two miles of Shavers Mountain lie in Tucker County and the next 20 miles are entirely in Randolph, but from the head of Greenbrier

River to the gap east of Cheat Bridge, 11 miles, this mountain makes the line between Randolph and Pocahontas. From this gap southwestward Back Allegheny also makes the line between the same counties for three miles, beyond which it is entirely in Pocahontas.

This combined range forms the dividing ridge between Otter Creek and Shavers Fork on the west, and Glady Fork and West Fork of Greenbrier on the east. The high tops, which vary from 3,745 feet at the Tucker-Randolph line to 4,842 feet at Bald Knob, Pocahontas County, are entirely formed by hard Pottsville rocks dipping westward toward the North Potomac (Georges Creek) Syncline. Many of the gaps, which are often 300 to 500 feet below the tops, are eroded into the softer Mauch Chunk. On the eastern side the slopes are uniformly steep in the upper half, but broken near the middle by the Pocono-Greenbrier shelf and finally descending to a maze of Upper Devonian hillocks and ridges. On the west the slopes are less abrupt but the land is exceedingly rough with many ledges and loose boulders.

Middle Mountain.—Middle Mountain starts at Dry Fork of Cheat River between Glady Fork and Laurel Fork, in the edge of Tucker County just north of the Randolph line. From this point its direction is southwestward, one mile through Tucker, 21 miles through Randolph, three miles with the Randolph-Pocahontas line, and the final three miles in Pocahontas, making a total length of 28 miles. The most northern top in Tucker County has an elevation of 2,850 feet but to the southward there is a gradual rise, the highest point of the ridge in Randolph County at the head of Laurel Fork being 4,010 feet and a knob just in the edge of Pocahontas being 4,015 feet. This mountain is almost entirely composed of Catskill outcrops, there being a brief sector of Chemung sediments where the range is diagonally crossed by the Blackwater Anticline a few miles north of Wymer. Its upper topography is fairly gentle, there being a county road and cultivated farms along ten miles of its northern end while farther south it is a wilderness of cut-over and uninhabited land. The topography of its lower slopes is more varied, with many rather rough transverse ridges and foot-hills.

Rich Mountain (West of Dry Fork).—Rich Mountain, west of Dry Fork, lies between Laurel Fork and Dry Fork of Cheat, starting two miles south of Jenningston and extending southwestward 17 miles through Randolph County to an abrupt ending one mile northwest of Osceola. Its most northern top is 3,315 feet but it soon ascends to 4,035 feet and Haines Knob just south of the Elkins-Franklin road is

4,272 feet. Farther south the tops are much the same, the highest point being 4,335 feet at an unnamed knob near the head of Dry Fork. This range is characterized by high tops and deep wind-gaps which are often 400 to 700 feet below the tops. Gregg Knob, Haines Knob, and an unnamed summit north of the Elkins-Franklin road are covered by hard Pottsville rocks but generally the entire upper portion of the ridge is formed by Mauch Chunk sediments, the land being mostly cleared and used for grazing. On the western slope and the northern part of the eastern slope the rather steep sides are broken by the Pocono-Greenbrier shelf, but on the eastern side from Harman south to the head of Dry Fork erosion has not gone down to this level.

Little Middle Mountain.—Little Middle Mountain lies between Dry Fork of Cheat and Gandy Creek of Dry Fork, starting near the junction of these streams northwest of Whitmer and extending southwestward ten miles to the Randolph-Pocahontas line just north of Mauch Chunk sediments and it is likewise characterized by extremely deep wind-gaps eroded through these soft shales. Its northern top is 3,815 feet and its southern summit next to Blister Swamp is 4,101 feet, but Pharis Knob, two miles north of Osceola, is 4,674 feet.

Allegheny Front and Allegheny Mountain.—Allegheny Front and Allegheny Mountain together comprise the line between Randolph and Pendleton Counties. Allegheny Front, which is a southward extension of Dans Mountain of Maryland, starts at the gap of North Branch of Potomac River west of Keyser, Mineral County, and extends southwestward 40 miles through Mineral County, Grant County, and along the Grant-Tucker line to the common corner of these counties with Randolph and thence with the Randolph-Grant line one-half mile to the common corner with Pendleton. From this point for 12 miles by ridge measurement, or 10 miles by air-line, to Brierpatch Mountain the ridge is very crooked but with a general southwesterly course, being known partly as Red Creek Plains and partly as Roaring Plains with the general title of Allegheny Front. From Brierpatch Mountain southward for 17 miles to the common corner of Randolph, Pendleton, and Pocahontas Counties, and for many miles thereafter in other southern counties it is known as Allegheny Mountain.

In the Allegheny Front sector of this range in or along Randolph County the topography is both high and rough. At the common corner of Randolph with Tucker and Grant the elevation is above 4,100 feet and at the western end of the Roaring Plains east of Harman it is 4,760 feet, and Brierpatch Mountain is 4,415 feet, but the latter more properly belongs with Allegheny Mountain. The Roaring Plains, partly in Randolph and partly in Pendleton, are held up by a huge shoulder of Pottsville and Allegheny rocks above which is preserved a considerable area of the softer Conemaugh along the Stony River Syncline, thus accounting for the unusual feature of this high plateau. Below the Pottsville in Randolph County the middle slopes are formed by the softer Mauch Chunk shales, followed in turn by the Pocono-Greenbrier shelf which is near the base. On the Pendleton County side of the mountain the slopes are extremely steep and rough.

Allegheny Mountain, proper, starting at Brierpatch Mountain east of Hazelwood, extends southward to the head of Lower Two Spring Run southeast of Horton and thence southwestward to the head of Gandy Creek and beyond. Brierpatch Mountain at 4,415 feet, and Job Knob at 4,470 feet, are covered with a mantle of hard Pottsville, but farther south the Pottsville belongs above the topography and successively older formations make the tops. Mississippian sediments form both the tops and gaps from the head of Stinking Run southeast of Job to an unnamed knob 1½ miles southeast of Horton, beyond which the Catskill occurs for four miles to be followed in turn by the Chemung which continues along the ridge to the Randolph-Pendleton-Pocahontas County corner. Most of these tops made by the Upper Devonian are slightly lower than the Pottsville summits farther north but there is less relief between the tops and gaps.

It is not apparent that the Allegheny Mountain should be considered as a structural extension of the Allegheny Front. A study of the geological structure and outcrops of Randolph, Pendleton, Grant, Tucker, and Mineral Counties reveals the fact that the Allegheny Front from Randolph County northeastward for many miles lies just southeast of the Stony River Syncline and thereafter just east of the North Potomac (Georges Creek) Basin when the Stony River structure has merged with it. Along the sector mentioned the Allegheny Front is the most southeastern Pottsville escarpment known to exist. Returning now to the Roaring Plains the maps show that the Stony River Syncline continues southwestward across Seneca Creek and thence with Spruce Mountain through Pendleton County. Part of Spruce Mountain is covered by Pottsville and this mountain apparently belongs to the same geologic structure as the Roaring Plains. It would follow that a restored escarpment of the Allegheny Front should lie slightly southeast of the present summit of Spruce Mountain. When traced still farther southwest, however, it is evident that Allegheny Mountain, as named on the maps along portions of the Pocahontas-Highland County line and also at the common corner of Pocahontas with Highland and Bath Counties, Virginia, and also at the common corner of Pocahontas and Greenbrier with Bath County, Virginia, is entirely on the eastern side of the Stony River Syncline and therefore in the structural position of the Allegheny Front of Grant and other northern counties. It would thus appear that the portion of Allegheny Mountain as now named on the maps from Brierpatch Mountain, Randolph County, southwestward to the point where the Staunton and Parkersburg Pike crosses the West Virginia-Virginia State line eight or ten miles southeast of Durbin, should not properly be regarded as part of the Allegheny Front mountain structure but as a separate anticlinal structure which now fortuitously bears a misleading title. Evidently that portion of the Allegheny Front, or Allegheny Mountain, which formerly connected the southern end of Spruce Mountain with the Allegheny Mountain from the Staunton and Parkersburg Pike southwestward has been obliterated by erosion.

DRAINAGE BASINS.

A general view of the drainage system of Randolph County is afforded by Figure 3, prepared by Mr. George W. Grow, and a study of the same may be pursued in more detail on Maps I and II which are furnished in a separate atlas and which reveal the relationships of the drainage to the topography and structural geology. In the northern portion of the county the flow of the major streams is generally parallel to the mountain ranges and the geologic structure. One exception is the gap which Tygart River cuts through the Laurel Ridge-Rich Mountain range northwest of Elkins. Another is the similar gap cut by Shavers Fork of Cheat River across the McGowan Mountain-Cheat Mountain range west of Bowden. Dry Fork of Cheat, also, from the mouth of Red Creek to Parsons, Tucker County, flows northwestward across the geologic structure, separating Shavers Mountain from Mozark and Canaan and making a gap between McGowan and Backbone. In the southern end of the county the course of Elk River is transverse to the general mountain system but the same statement is true of Point Mountain itself which closely parallels the river.

The secondary drainage is usually tranverse to the alignment of the mountains and the geologic structure, but there are various upland streams which are parallel to the structure for a few miles before breaking across it.

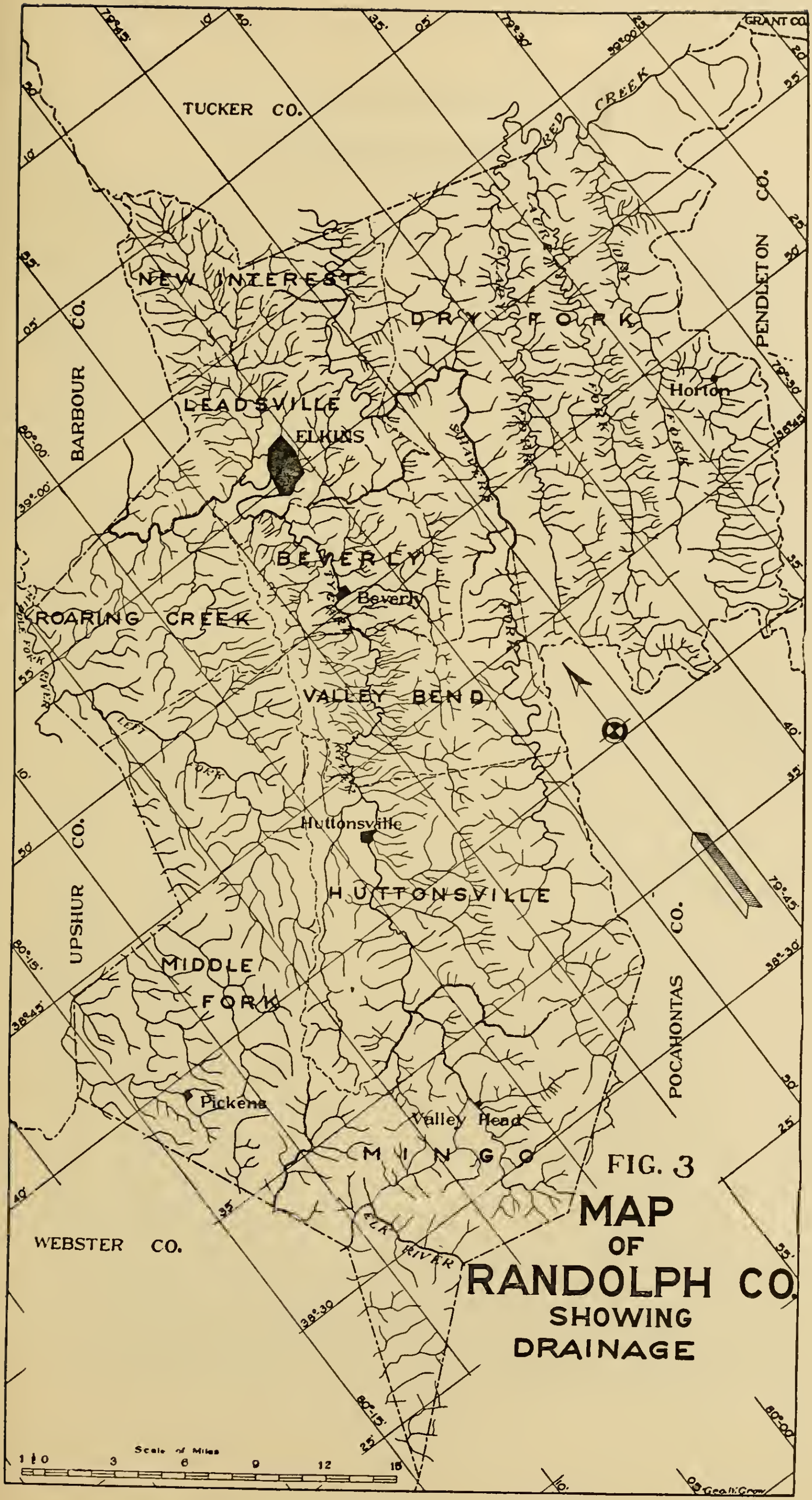


FIG. 3

MAP OF RANDOLPH CO. SHOWING DRAINAGE

TABLE OF STREAM DATA

The following table, mainly prepared by the writer, gives a list of the principal streams of the county, the rate of fall and length, both actual stream measurement and air-line distances being determined. The last column shows the ratio between the total distance (T. D.) and the air-line distance (A. L. D.). Those having the greatest ratio are usually streams that have more nearly reached base-level at some period in their history, while others have apparently preserved more direct courses or have lost their ancient meanders:

Table of Stream Data.

STREAMS	Total Distance. Miles.	Total Fall. Feet.	Rate of Fall per Mile. Feet.	Air-Line Distance. Miles.	Ratio T. D. to A. L. D.
Tygart River, source to mouth	130.2	3130	24.04	69.6	1.87
Tygart River, source to Valley Head	9.3	1620	174.19	6.8	1.37
Tygart River, Valley Head to Mill Creek	16.7	405	24.25	14.1	1.18
Tygart River, Mill Creek to Elkins (Davis Avenue bridge)	25.2	70	2.78	14.3	1.76
Tygart River, Elkins to Belington	18.2	225	12.36	8.7	2.09
Buckhannon River, source (of Right Fork) to mouth	58.7	1825	31.09	33.9	1.73
Buckhannon River, source to Silica	5.5	820	149.09	4.9	1.12
Buckhannon River, Silica to Alexander	9.0	475	52.78	6.9	1.30
Left Fork, source to mouth (Alexander)	15.4	1675	108.77	11.5	1.34
Left Fork, source to Beech Run	5.8	1065	183.62	5.4	1.07
Left Fork, Beech Run to mouth (Alexander)	9.6	610	63.54	7.9	1.22
Bear Camp Run	4.0	850	212.50	3.7	1.08
Lick Run	2.2	675	306.82	2.0	1.10
Lower Dry Run	1.7	850	500.00	1.6	1.06
Dry Run	2.0	950	475.00	1.7	1.17
Beech Run	4.3	815	189.53	3.8	1.13
Phillips Camp Run	2.9	1035	356.90	2.4	1.21
Morgan Camp Run	2.1	1000	476.19	2.0	1.05
Left Fork (of Right Fork), source to mouth (Newlonton)	10.7	1300	121.49	7.3	1.47
Left Fork, source to Helvetia	4.7	960	204.26	4.0	1.17
Left Fork, Helvetia to mouth (Newlonton)	6.0	340	56.66	3.4	1.76
Trout Run	2.7	680	251.85	2.6	1.03
Upper Trout Run	2.5	610	244.00	2.1	1.19
Anderson Camp Run	2.0	600	300.00	1.8	1.11
Middle Fork (of Right Fork), source to mouth	4.1	800	195.12	3.7	1.11
See Shanty Run	2.7	725	268.52	2.5	1.08
Hooker Run	2.0	600	300.00	1.9	1.05
Devil Fork	2.8	535	191.07	2.2	1.27
Marsh Fork	4.5	700	155.55	4.0	1.12
Middle Fork River, source (of Left Fork) to mouth	38.9	2220	57.07	28.2	1.38
Middle Fork River, source to Adolph	7.3	1400	191.78	7.0	1.04
Middle Fork River, Adolph to Cassity	6.7	300	44.77	5.7	1.17
Middle Fork River, Cassity to Right Fork	7.8	175	22.43	6.4	1.21

Table of Stream Data.—(Continued).

STREAMS	Total Distance, Miles.	Total Fall, Feet.	Rate of Fall per Mile, Feet.	Air-Line Distance, Miles.	Ratio T. D. to A. L. D.
Middle Fork River, Right Fork to mouth	17.1	345	20.18	11.9	1.43
Devil Run	2.3	450	195.65	2.2	1.05
Hell Run	3.0	500	166.66	2.8	1.07
Laurel Creek	4.7	600	127.66	3.7	1.27
Brook Run	2.8	400	142.86	2.7	1.04
Kettle Run	2.4	800	333.33	2.3	1.04
Long Run	8.0	1275	159.38	7.8	1.03
Cassity Fork	6.0	1350	225.00	5.3	1.13
Panther Run	4.6	1000	217.31	3.8	1.22
Mulberry Fork	2.5	500	200.00	2.1	1.19
Three Forks Run	2.9	1000	344.83	2.8	1.04
Stonecoal Run	2.8	900	321.43	2.6	1.08
Laurel Run	2.8	930	332.14	2.4	1.17
Laurel Branch	3.8	840	221.01	3.3	1.15
Schoolcraft Run	2.8	900	321.43	2.7	1.04
Birch Fork	6.3	1150	182.54	5.4	1.17
Mitchell Lick Fork	2.5	600	240.00	2.3	1.09
Beaver Creek	4.8	775	161.45	4.0	1.20
Big Laurel Run (at Findley)	4.2	600	142.85	3.6	1.17
Roaring Creek, source to mouth	12.5	980	78.40	6.7	1.87
Roaring Creek, source to Fisher	6.0	600	100.00	3.2	1.88
Roaring Creek, Fisher to mouth	6.5	380	58.46	4.4	1.48
Leading Creek, source to mouth	16.4	510	31.19	13.2	1.24
Leading Creek, source to Montrose	3.5	420	120.00	3.2	1.09
Leading Creek, Montrose to mouth	13.0	90	6.92	10.2	1.27
Craven Run	5.4	555	101.85	4.7	1.15
Claylick Run	3.7	350	94.59	3.5	1.06
Roney Run	2.5	580	232.00	1.9	1.32
Pearcy Run	3.9	375	96.15	3.7	1.05
Stalnaker Run	3.7	625	168.91	3.2	1.16
Horse Run	1.9	100	52.63	1.6	1.19
Davis Lick Run	3.8	550	144.73	3.4	1.12
Lambert Run	2.8	550	196.43	2.2	1.27
Stonespring Run	3.7	400	108.10	3.1	1.19
Cherry Fork	3.5	430	122.85	3.2	1.09
Saltlick Run	3.4	475	139.70	2.5	1.36
Laurel Run	2.6	400	153.84	2.2	1.18
Chenoweth Creek, source (of Right Fork) to mouth	8.7	1475	169.54	7.0	1.24
Chenoweth Creek, source to Left Fork	3.4	1250	361.71	3.1	1.09
Chenoweth Creek, Left Fork to mouth	5.3	225	42.45	3.8	1.40
Isner Creek	5.2	800	153.85	4.8	1.08
Laurel Fork	2.4	800	333.33	1.9	1.26
Left Fork	2.9	600	206.90	2.3	1.26
Beaver Creek	5.9	830	140.68	5.4	1.09
Kings Run	3.9	730	187.17	3.2	1.22
Dodson Run	3.5	575	164.29	3.1	1.13
Files Creek, source (of Right Fork) to mouth	9.9	1025	103.54	7.4	1.34
Files Creek, source to Left Fork	7.0	940	134.29	6.4	1.09
Files Creek, Left Fork to mouth	2.9	85	29.31	2.7	1.07
Left Fork	4.6	1500	326.09	3.9	1.18
Stalnaker Run	2.8	500	178.57	2.4	1.17
Jones Run	2.8	950	339.28	2.6	1.08
Ward Run	2.7	640	237.04	2.1	1.29
Crawford Run	2.7	830	307.41	2.5	1.08
Shavers Run	6.5	1075	165.38	5.5	1.18
Dry Run	3.4	800	235.29	3.2	1.06
Mill Creek, source to mouth	14.0	1610	115.00	12.5	1.12
Mill Creek, source to Potatohole Fork	3.0	395	131.67	2.5	1.20
Mill Creek, Potatohole Fork to mouth	11.0	1215	110.45	9.5	1.16
Right Fork	5.6	660	117.86	4.8	1.17
Riffle Creek (head McGee Run)	6.5	1550	238.46	4.9	1.33
Becky Creek	8.7	1600	183.91	7.4	1.18
Poundmill Run	2.4	630	262.50	2.0	1.20

Table of Stream Data.—(Continued).

STREAMS	Total Distance. Miles.	Total Fall. Feet.	Rate of Fall per Mile. Feet.	Air-Line Distance. Miles.	Ratio T. D. to A. L. D.
Elkwater Fork, source to mouth	7.1	1090	153.52	4.9	1.45
Elkwater Fork, source to Stony Run	3.4	830	244.11	1.7	2.00
Elkwater Fork, Stony Run to mouth	3.7	260	70.27	3.3	1.12
Stewart Run	7.2	1840	255.55	5.7	1.26
Hamilton Run	2.8	600	214.29	1.9	1.47
Conley Run	3.8	1300	342.11	3.6	1.05
Ralston Run	5.8	1050	181.03	4.3	1.36
Windy Run	4.7	1470	312.77	4.5	1.04
Logan Run	2.8	1120	400.00	2.6	1.07
Big Run	4.6	1225	266.30	4.0	1.15
Elk River, source to Whitaker Falls (top)	22.0	1815	82.50	14.2	1.55
Elk River, source to Dry Fork	15.0	1525	101.66	10.6	1.41
Elk River, Dry Fork to Whitaker Falls (top)	7.0	290	41.43	5.1	1.37
Back Fork, source to mouth	24.3	2060	84.77	19.5	1.25
Back Fork, source to Big Run	7.1	1000	140.85	6.4	1.11
Back Fork, Big Run to Sugar Creek	7.5	610	81.33	6.2	1.21
Back Fork, Sugar Creek to mouth	9.7	450	46.39	7.8	1.24
Sugar Creek	11.0	1560	141.82	9.5	1.15
Little Sugar Creek	6.8	1050	154.41	5.8	1.17
Big Run	2.6	850	326.92	2.0	1.30
Flint Run	1.8	800	444.44	1.7	1.06
Mitchell Run	1.9	775	407.89	1.6	1.18
Hewett Fork	2.7	740	274.07	2.5	1.08
Vandevender Fork	3.2	525	164.06	2.6	1.23
Hickorylick Run	2.0	1275	637.50	1.9	1.05
Valley Fork	3.7	750	202.70	3.2	1.15
Chimney Rock Run	2.6	1650	634.62	2.2	1.18
Rough Gap Run	1.6	1000	625.00	1.5	1.06
Falling Spring Run	1.8	850	472.22	1.7	1.05
Dry Fork	5.2	1070	205.77	4.8	1.08
Douglas Fork	2.0	520	260.00	1.9	1.05
Shavers Fork of Cheat River, source to mouth	83.4	2875	34.47	52.8	1.58
Shavers Fork, source to Second Fork	9.6	780	81.25	7.9	1.21
Shavers Fork, Second Fork to Stonecoal Run	12.6	200	15.87	9.8	1.29
Shavers Fork, Stonecoal Run to Bemis	24.0	955	39.79	15.0	1.60
Shavers Fork, Bemis to Taylor Run (near Bowden)	7.9	345	43.67	7.0	1.13
Shavers Fork, Taylor Run to Pheasant Run	24.2	495	20.45	9.7	2.49
Shavers Fork, Pheasant Run to mouth	5.2	100	19.23	4.8	1.08
Pheasant Run	3.5	475	135.71	3.4	1.03
Nail Run	1.6	650	406.25	1.5	1.06
Boar Run	1.3	475	365.38	1.2	1.08
Little Black Fork	4.1	1100	268.29	3.1	1.32
Clifton Run	3.2	550	171.87	3.1	1.03
Rattlesnake Run	4.3	1350	313.95	2.8	1.53
Johns Run	2.5	1500	600.00	2.4	1.04
Walker Run	1.6	1200	750.00	1.4	1.14
Bickle Run	1.6	950	593.75	1.4	1.14
Taylor Run	2.8	880	314.29	2.5	1.12
Collett Gap Run	1.6	1250	781.25	1.4	1.14
Upper Pond Lick	2.8	1100	392.86	2.6	1.07
Red Creek	2.0	1350	675.00	1.8	1.11
Fishinghawk Creek	3.6	1150	319.44	2.7	1.33
Red Roaring Run	2.1	1000	476.19	1.8	1.17
Red Run	1.5	875	583.33	1.3	1.15
Fall Run	2.6	780	300.00	2.3	1.13
Stalnaker Run	1.6	525	328.12	1.4	1.14
Suter Run	1.7	500	294.12	1.5	1.13
McGee Run	1.9	380	200.00	1.8	1.05
Yokum Run	2.7	400	148.15	2.5	1.08
Crouch Run	2.8	530	189.29	2.5	1.12
Glade Run	2.6	425	163.46	2.5	1.04

Table of Stream Data—(Concluded).

STREAMS	Total Distance. Miles.	Total Fall. Feet.	Rate of Fall per Mile. Feet.	Air-Line Distance. Miles.	Ratio T. D. to A. L. D.
Whitmeadow Run	2.5	450	180.00	2.1	1.19
Stonecoal Run	2.6	330	126.92	2.4	1.08
Red Run	2.5	225	90.00	2.3	1.09
Blister Run	1.8	160	88.88	1.6	1.13
Fish Hatchery Run	2.8	850	303.57	2.6	1.08
Lambert Run	2.9	680	234.48	2.3	1.27
First Fork	5.0	500	100.00	4.8	1.04
Black Run	1.8	520	288.88	1.6	1.13
Beaver Creek	1.8	270	150.00	1.7	1.05
Dry Fork of Cheat River, source to mouth (Parsons)	40.3	2175	53.97	26.3	1.53
Dry Fork, source to Gandy Creek	8.7	1050	120.69	8.2	1.06
Dry Fork, Gandy Creek to Red Creek	11.7	525	44.87	10.8	1.08
Dry Fork, Red Creek to mouth (Parsons)	20.4	525	25.74	13.1	1.56
Otter Creek, source to mouth	13.0	1880	144.62	9.0	1.44
Otter Creek, source to Moore Run	7.3	1120	153.42	5.4	1.35
Otter Creek, Moore Run to mouth	5.7	760	133.33	3.6	1.56
Moore Run	2.4	770	320.83	2.2	1.09
Devils Gulch	2.0	675	337.50	1.9	1.05
Yellow Creek	1.7	400	235.29	1.6	1.06
Condon Run	2.1	600	285.71	1.9	1.11
Glady Fork, source (of East Fork) to mouth	34.7	1670	48.13	23.2	1.50
Glady Fork, source to West Fork	7.8	760	97.44	5.8	1.35
Glady Fork, West Fork to Evenwood	10.5	220	20.95	7.9	1.33
Glady Fork, Evenwood to mouth	16.4	690	42.00	9.8	1.67
Panther Camp Run	1.8	680	377.78	1.6	1.13
Five Lick Creek	1.6	550	343.75	1.4	1.14
Low Gap Run	1.8	230	127.78	1.5	1.20
Flannigan Run	1.6	370	231.25	1.3	1.23
McCray Creek	2.3	525	228.26	2.0	1.15
Frazier Creek	1.4	300	214.29	0.9	1.56
Daniels Creek	3.2	525	164.06	2.8	1.14
West Fork	5.2	350	67.31	4.7	1.10
Louk Run	2.2	575	261.36	1.8	1.22
Laurel Fork, source to mouth	32.1	1960	61.05	23.3	1.37
Laurel Fork, source to Five Lick Run	7.6	925	121.72	5.2	1.46
Laurel Fork, Five Lick Run to Job Run (near Wymer)	12.0	305	25.42	10.8	1.11
Laurel Fork, Job Run to mouth	12.5	730	58.40	7.8	1.60
Snyder Run	2.3	1030	447.83	1.9	1.20
Beaverdam Run	2.7	400	148.15	1.6	1.69
Five Lick Run	2.7	375	138.89	2.2	1.23
Elk Run	2.8	225	80.35	2.4	1.17
Red Creek, source to mouth	16.6	1850	111.44	11.2	1.48
Red Creek, source to South Fork	10.2	1400	137.25	7.8	1.31
Red Creek, South Fork to mouth	6.4	550	85.94	5.9	1.08
Big Run	3.4	1300	382.35	3.3	1.03
Flatrock Run	2.7	1300	481.48	2.6	1.04
South Fork	5.7	1800	315.79	3.0	1.90
Spruce Run	3.3	1450	439.39	3.2	1.03
Horsecamp Run	4.5	1000	222.22	4.2	1.07
Tony Camp Run	2.1	1050	500.00	1.9	1.11
Stinking Run	2.4	1100	458.33	2.0	1.19
Gandy Creek, source to mouth	18.6	1230	66.12	10.9	1.71
Gandy Creek, source to cavern outlet near Osceola	5.8	400	68.97	3.2	1.82
Gandy Creek, cavern outlet to mouth	12.8	830	64.84	8.6	1.49
Lower Two Spring Run	2.2	1000	454.50	1.9	1.16
Upper Two Spring Run	2.5	1000	400.00	1.9	1.32
Swallow Rock Run	1.9	700	368.42	1.7	1.12
Big Run	4.0	700	175.00	3.1	1.29
Grants Branch	2.7	500	185.18	2.5	1.08
Narrow Ridge Run	2.9	500	172.41	2.6	1.12

AREAS OF DRAINAGE BASINS.

The following table, prepared by the writer, gives a planimetric determination of the areas of the principal drainage basins of Randolph County, the joint topographic maps of the United States and West Virginia Geological Surveys being used for authority as to their watersheds:

Areas of Drainage Basins.

Streams	Sq. Mi.
Tygart River, entire	1435.00
Tygart River, above Middle Fork	431.39
Tygart River, above and including Roaring Creek	366.46
Tygart River, above Leading Creek	271.38
Tygart River, above Mill Creek	129.71
Tygart River, above Mingo Run	9.63
Buckhannon River, entire	310.15
Buckhannon River, Left Fork, entire	37.40
Bearcamp Run	3.38
Lick Run	1.65
Lower Dry Run	1.62
Dry Run	2.08
Beech Run	6.96
Phillips Camp Run, entire	3.62
Morgan Camp Run	1.83
Buckhannon River, Right Fork, entire	53.00
Left Fork of Right Fork, entire	18.15
Trout Run	2.48
Upper Trout Run	2.77
Anderson Camp Run	1.33
Middle Fork of Right Fork, entire	7.17
See Shanty Run	1.52
Hooker Run	1.38
Devil Fork	2.38
Marsh Fork	4.34
Middle Fork River, entire	151.20
Middle Fork River, above and including Devil Run	122.68
Devil Run	2.28
Hell Run	2.14
Laurel Creek, entire	8.20
Brook Run	2.79
Right Fork	31.00
Left Fork, entire	78.75
Left Fork, above Mitchell Lick Fork (at Adolph)	8.79
Kettle Run	2.63
Long Run	8.79
Cassity Fork, entire	16.20
Panther Run	4.24
Mulberry Fork	1.75
Three Forks Run	2.72
Stonecoal Run	3.10
Laurel Run	2.16
Laurel Branch	3.46
Schoolcraft Run	3.14
Birch Fork	9.75
Mitchell Lick Fork	1.50

Areas of Drainage Basins—(Continued).

Streams	Sq. Mi.
Beaver Creek	8.31
Big Laurel Run (at Findley)	4.54
Roaring Creek, entire	29.52
Roaring Creek, above Flatbush Fork	7.45
Laurel Run	3.36
Flatbush Fork	5.23
Leading Creek, entire	61.16
Craven Run	4.60
Claylick Run	5.62
Roney Run	1.00
Pearcy Run	4.52
Stalnaker Run	6.05
Horse Run	1.31
Davis Lick Run	3.42
Lambert Run	2.28
Stonespring Run	3.73
Cherry Fork	3.76
Schoolcraft Run	2.54
Saltlick Run	2.02
Laurel Run	2.26
Chenoweth Creek, entire	22.52
Isner Creek	7.07
Laurel Fork	1.73
Left Fork	4.32
Right Fork	2.82
Beaver Creek	9.01
Kings Run	4.76
Dodson Run	2.74
Files Creek, entire	20.83
Left Fork	7.00
Right Fork	11.98
Stalnaker Run	2.78
Jones Run (at Steiner)	2.52
Ward Run	1.53
Crawford Run	2.17
Shavers Run	8.57
Jones Run (0.5 mile north of Mill Creek)	1.48
Dry Run	2.56
Mill Creek, entire	24.11
Mill Creek, above Right Fork	17.49
Right Fork	6.03
Potatohole Fork	1.77
Donley Run	1.83
Riffle Creek	11.05
Becky Creek, entire	14.55
Big Branch	2.74
Poundmill Run	2.04
Spice Run	0.81
Gibson Run	0.90
Hamilton Run (at Elkwater)	1.87
Clay Run	2.82

Areas of Drainage Basins—(Continued).

Streams	Sq. Mi.
Elkwater Fork, entire	13.64
Mowry Run	1.93
Limekiln Run	1.85
Stony Run	1.98
Stewart Run	10.82
Hamilton Run (below Conley Run)	2.32
Conley Run	5.00
Ralston Run	8.07
Windy Run	6.85
Logan Run	2.64
Big Run	4.12
Mingo Run	2.33
Elk River, entire	1550.00
Elk River, above Back Fork	172.66
Elk River, above Whitaker Falls	102.85
Elk River, above and including Dry Fork	75.64
Back Fork, entire	71.12
Back Fork, above Sugar Creek	32.59
Sugar Creek, entire	23.29
Little Sugar Creek	7.09
Big Run	3.48
Flint Run	1.89
Mitchell Run	1.79
Hewett Fork	2.65
Vandevender Fork	3.88
Leatherwood Creek, entire	19.80
Right Fork	7.37
Bergoo Creek	11.73
Hickorylick Run	2.18
Valley Fork, entire	8.26
Mudlick Run	2.64
Chimney Rock Run	1.96
Rough Gap Run	1.43
Falling Spring Run	2.53
Dry Fork, entire	10.25
Douglas Fork	2.33
Gauley River, above and including Right Fork	13.54
South Fork	2.95
Middle Fork	3.77
North Fork	6.78
Shavers Fork of Cheat River, entire	212.88
Shavers Fork, above Laurel Run (Randolph-Tucker line)	180.23
Shavers Fork, above Fishinghawk Creek (at Bemis)	111.24
Shavers Fork, above Second Fork	16.96
Pheasant Run	7.94
Nail Run	0.95
Boar Run	0.85
Little Laurel Run	1.34
Little Black Fork	4.60
Clifton Run	2.52
Rattlesnake Run	3.93
Johns Run	1.78
Walker Run	0.92

Areas of Drainage Basins—(Continued).

Streams	Sq. Mi.
Bickle Run	1.73
Taylor Run	3.93
Wilson Run	1.42
Collett Gap Run	1.21
Lower Pond Lick	0.80
Upper Pond Lick	2.86
Red Creek	1.27
Wolf Run	1.06
Fishinghawk Creek	4.83
Red Roaring Run	1.97
Red Run	1.21
Fall Run	2.88
Stalnaker Run	1.21
Suter Run	2.71
McGee Run	2.38
Yokum Run	2.16
Crouch Run	2.87
Glade Run	2.19
Whitmeadow Run	2.88
Stonecoal Run	3.34
Red Run	3.86
Blister Run	2.11
Fish Hatchery Run	3.20
Lambert Run	3.15
First Fork	9.97
Black Run	1.59
Beaver Creek	1.62
Second Fork	6.84
Dry Fork of Cheat River, entire	501.65
Dry Fork, above Laurel Fork (at Jenningston)	158.91
Dry Fork, above Gandy Creek	12.71
Otter Creek, entire	28.87
Otter Creek, above Randolph-Tucker line	17.45
Moore Run	3.40
Possession Camp Run	2.20
Devils Gulch	2.39
Harper Run	0.96
Yellow Creek	1.40
Condon Run	1.60
Glady Fork, entire	65.34
Panther Camp Run	1.89
Five Lick Creek	1.25
Low Gap Run	1.70
Flannigan Run	0.82
Nichols Lane Run	2.08
McCray Creek	1.48
Frazier Creek	1.42
Daniels Creek	3.79
West Fork	6.37
East Fork	11.09
Louk Run	1.98
Laurel Fork, entire	60.71
Snyder Run	2.34

Areas of Drainage Basins—(Concluded).

Streams	Sq. Mi.
Beaverdam Run	2.47
Five Lick Run	4.06
Elk Run	2.48
Red Creek, entire	62.37
Red Creek, above South Fork	31.98
Big Run	3.32
Flatrock Run	4.00
South Fork	8.95
Spruce Run	3.84
Horsecamp Run	7.76
Tony Camp Run	2.65
Stinking Run	1.96
Gandy Creek, entire	43.04
Gandy Creek, above and including sink at Osceola	9.34
Lower Two Spring Run	1.50
Upper Two Spring Run	1.48
Swallow Rock Run	2.30
Big Run	4.24
Grants Branch	1.22
Narrow Ridge Run	1.31

DESCRIPTIONS OF DRAINAGE BASINS.

Tygart River.

Tygart River, which with its tributaries drains a considerable portion of the central and northeastern part of Randolph County, is a northward-flowing stream having its rise in Pocahontas County 1½ miles west of Spruce, and, together with West Fork, forming the Monongahela River at Fairmont. The tidal elevation at its source is approximately 4000 feet; at Elkins it is 1900 feet; at the Randolph-Barbour line 1750 feet; at the Barbour-Taylor line 1000 feet; at Fairmont 870 feet, making a total fall of 3130 feet. Its length from head to mouth is 130.2 miles, the air-line distance being 69.6 miles. Its early course in the mountains is rapid but below Elkwater Fork it reaches a practically base-leveled condition which continues to the Rich Mountain gap below Elkins, the river valley being broad and straight with many meanders of the stream from side to side. Below the Rich Mountain gap the river undergoes a great transformation from its previously placid course and again becomes a rough and turbulent stream, littered with the debris from the Pottsville rocks through which it has cut its way. For several miles north and south of Belington, Barbour County, it is again quiet, due no doubt to the influence of the Belington Syncline which crosses it there. At Wilmoth Ford it again becomes rough and so remains all the way to Berryburg Junction below

Philippi, after which a few miles of quiet water appear. From Arden to the Barbour-Taylor County line it is rough and rapid, and from this point to its mouth at Fairmont its prevailing character is rough, although there are a few quiet stretches. The total area of its drainage basin is 1,435 square miles, the portion above and including Roaring Creek being 366.46 square miles.

The base-leveled condition of the Tygart River in Randolph County is due to the fact that most of its course therein lies through the soft shales of the Upper Devonian along the Deer Park Anticline, and to the further fact that this anticline is flanked on the west below Rich Mountain by hard Pottsville rocks. Along the axis of the anticline erosion has been easy but after reaching the Pottsville it has been difficult and hence the stream has been ponded, giving rise to the broad Tygart Valley.

The principal tributaries which drain portions of Randolph County, in ascending order, are: Buckhannon River, Middle Fork River, Beaver Creek, Big Laurel Run, Roaring Creek, Leading Creek, Chenoweth Creek, Beaver Creek, Kings Run, Dodson Run, Files Creek, Stalnaker Run, Jones Run, Ward Run, Crawford Run, Shavers Run, Dry Run, Mill Creek, Riffle Creek, Becky Creek, Poundmill Run, Elkwater Fork, Stewart Run, Hamilton Run, Conley Run, Ralston Run, Windy Run, Logan Run, and Big Run.

Besides certain stations in other counties farther down, the Water-Resources Branch of the United States Geological Survey has maintained since 1915 a gaging station near Dailey, Randolph County. The records of this station will be found in Chapter XII under the subject of "Water-Power".

Beaver Creek (near Weaver).—Beaver Creek, an eastern tributary of Tygart River, rises on the western slope of Laurel Ridge in Barbour County, 3 miles southeast of Belington, flows southward crossing the Barbour-Randolph line just above Weaver, flows westwardly through Randolph, and thence northwesterly across the county line again, and reaches Tygart River 1 mile above Junior. Its total length is 4.8 miles, its total fall 775 feet, and the area of its drainage basin 8.31 square miles.

Big Laurel Run (at Findley).—Big Laurel Run, a western tributary, rises in the low plateau country near King Summit School west of Coalton, flows generally northward and empties into Tygart River at Findley one-half mile above the Randolph-Barbour line. Its total length is 4.2 miles, its total fall from head to mouth 600 feet, and the area of its drainage basin 4.54 square miles.

Roaring Creek.—Roaring Creek a western tributary, rises on the western slope of Rich Mountain 3 miles southeast of Mabie, flows northwestward to Mabie and thence northward emptying into Tygart River one-half mile above Norton. Its total length is 12.5 miles, its total fall 980 feet, and the area of its drainage basin 29.52 square miles. Its principal tributaries are: Laurel Run, with an area of 3.36 square miles; and Flatbush Fork with an area of 5.23 square miles. Owing to the rough topography formed by the Allegheny and Pottsville rocks through which it flows this creek is mostly rough and turbulent and its watershed is largely wooded.

Leading Creek.—Leading Creek, an eastern tributary, rises in the extreme northwestern corner of Randolph County next to Tucker and Barbour at an elevation of about 2410 feet, flows generally southwestward and empties into Tygart River 2½ miles northwest of and below Elkins. Its total length from source to mouth it 16.4 miles, its total fall 510 feet, and the area of its drainage basin 61.16 square miles. Its principal tributaries in ascending order are Craven Run, Claylick Run, Roney Run, Pearcy Run, Stalnaker Run, Horse Run, Davis Lick Run, Lambert Run, Stonespring Run, Cherry Fork, Saltlick Run, and Laurel Run. Base-leveling has been far advanced in the valley of this creek, there being wide bottom lands and adjacent low hills and the rate of fall from Montrose to the mouth being only 12 feet per mile. In physiographic position it is a northward extension of the Tygart Valley and there are in fact some slight clay deposits at the head indicating that a little water may have once flowed northward into Clover Run of Cheat River, but this is by no means certain. Like the main Tygart Valley its base-leveling is largely due to the soft shales of the Upper Devonian through which it flows. In its present bottom there are numerous short meanders of recent origin.

Chenoweth Creek.—Chenoweth Creek, an eastern tributary, rises at the foot of Cheat Mountain seven miles southeast of Elkins, flows generally northwestward and empties into Tygart River near Arnold Hill 2½ miles south of and above Elkins. Its elevation at the headwaters is about 3385 feet, its total fall from head to mouth is 1475 feet, its total length 8.7 miles and the area of its drainage basin 22.52 square miles. Its principal tributaries are Isner Creek, Laurel Fork, and Left Fork. Its upper valley is narrow and the gradient of

PLATE VII.—Middle and Lower Kittanning Coal at West Virginia Coal & Coke Co. No. 1 Mine (Nos. 15 and 16 on Map II), at Coalton. Point of hammer is inserted at top of coal.

PLATE VIII.—Homewood Sandstone (above) and Upper Connoquenessing Sandstone (below) outcropping along Tygart River just southeast of Laurel Station. Topography of Pottsville Series.

PLATE IX.—Upper Connoquenessing Sandstone cliff, with large boulder split off; along Tygart River one mile northwest of Harding.

PLATE X.—"Balancing Rock", a remnant of the Upper Connoquenessing Sandstone at mouth of Roaring Creek, one-half mile southeast of Norton. Tygart River in foreground.

the stream is swift, but one mile below Laurel Fork the valley widens affording ample bottoms and low terraces.

Beaver Creek (near Beverly).—Beaver Creek, near Beverly, a western tributary, rises on the eastern slope of Rich Mountain four miles southwest of Beverly at an elevation of about 2700 feet, flows northeastward 3½ miles in a narrow upland valley and thence eastward for two miles, and empties into Tygart River two miles below and north of Beverly. Its total length from head to mouth by the meanders of the stream is 5.9 miles, its total fall 830 feet, and the area of its drainage basin 9.01 square miles. Its upper valley is steep but farther down it flows across the wide flood-plain of Tygart Valley.

Kings Run.—Kings Run, an eastern tributary, rises at the foot of Elliott Ridge at an elevation of about 2630 feet, flows generally westward, and empties into Tygart River 1½ miles below Beverly. Its total length is 3.9 miles, its total fall 730 feet, and the area of its drainage basin 4.76 square miles.

Dodson Run.—Dodson Run, an eastern tributary, rises at the foot of Elliott Ridge 2½ miles east of Beverly at an elevation of about 2500 feet, flows westward, and empties into Tygart River one mile north of Beverly. It total length is 3.5 miles, its total fall 575 feet, and the area of its drainage basin 2.74 square miles.

Files Creek.—Files Creek, an eastern tributary, rises at the foot of Cheat Mountain four miles southeast of Valley Bend at an elevation of about 2950 feet, flows northward for six miles through a narrow upland valley parallel to Cheat Mountain and Middle Ridge, and then northwestward to its junction with Tygart River just above Beverly. Its total length is 9.9 miles, its total fall 1025 feet, and the area of its drainage basin 20.83 square miles. In the lower 2½ miles of its course there is a broad cultivated valley. Its principal tributaries are Left Fork and Right Fork.

Stalnaker Run.—Stalnaker Run, an eastern tributary, rises at the foot of Middle Ridge at approximately 2425 feet, flows northwestward, and empties into Tygart River two miles above Beverly. Its total length is 2.8 miles, its total fall 500 feet, and the area of its drainage basin 2.78 square miles.

Jones Run (at Steiner).—Jones Run, at Steiner, a western tributary, heads against Rich Mountain at an elevation of nearly 3000 feet, flows southeastward, and empties into Tygart River just above Steiner. Its total length is 2.8 miles, its total fall 950 feet, and the area of its drainage basin 2.52 square miles.

Ward Run.—Ward Run, an eastern tributary, rises in the foot-hills of Cheat Mountain 3½ miles northeast of Valley Bend at an elevation of about 2550 feet, flows northwestward through a sharp narrow valley, and empties into Tygart River one mile above Steiner. Its total length is 2.7 miles, its total fall 640 feet, and the area of its drainage basin 1.53 square miles.

Crawford Run.—Crawford Run, an eastern tributary, rises in the foot-hills of Cheat Mountain southeast of Valley Bend at an elevation of about 2800 feet, flows northwestward, and empties into Tygart River just southeast of Valley Bend. Its total length is 2.7 miles, its total fall 830 feet, and the area of its drainage basin 2.17 square miles.

Shavers Run.—Shavers Run, an eastern tributary, rises at the foot of Cheat Mountain four miles southeast of Mill Creek at an elevation of slightly above 3,000 feet, flows northward in a narrow upland valley between Cheat Mountain and Chestnut Ridge for 2½ miles and thence northwestward, and empties into Tygart River just above Valley Bend. Its total length is 6.5 miles, its total fall 1075 feet, and the area of its drainage basin 8.57 square miles.

Dry Run.—Dry Run, an eastern tributary, heads against Chestnut Ridge at an elevation of 2800 feet, flows northwestward, and empties into Tygart River slightly below Mill Creek. Its total length is 3.4 miles, its total fall 800 feet, and the area of its drainage basin 2.56 square miles.

Mill Creek.—Mill Creek, a western tributary, rises near the southern end of Rich Mountain four miles west of Spangler at an elevationo of about 2610 feet, flows northeastward, and empties into Tygart River at Mill Creek town. Its total length is 14.0 miles, its total fall 1610 feet, and the area of its drainage basin 24.11 square miles. Its principal tributaries are Right Fork and Potatohole Fork. Right Fork has a drainage basin of 6.03 square miles and heads against the slope of Rich Mountain 2½ miles northwest of Valley Bend and flows southwestward through a sharp upland valley uniting with the parent stream one mile above Mill Creek town. Mill Creek itself also flows through a narrow valley with steep sides for many miles, the territory being wooded and almost uninhabited. In the lower 2½ miles of its course, however, there is bottom land.

Riffle Creek.—Riffle Creek, an eastern tributary, heads against Cheat Mountain five miles southeast of Huttonsville at an elevation of about 3550 feet, flows southwestward for 2½ miles between Chestnut Ridge and Cheat Mountain, being known as McGee Run in this portion of its course, and thence turns northwestward, and empties into Tygart River one mile above Huttonsville. Its upper valley is narrow and restricted but for the last two miles the flood-plain broadens and there are wide cultivated bottoms. Its total length, including McGee Run, is 6.5 miles, is total fall 1550 feet, and the area of its drainage basin 11.05 square miles. Its principal tributaries are Laurel Run and McGee Run, which latter is the main stream, and Back Fork.

Becky Creek.—Becky Creek, an eastern tributary, heads at the foot of Cheat Mountain near Crouch Knob at an elevation of 3650 feet, flows generally northwestward and empties into Tygart River just above Lee Bell. Its total length is 8.7 miles, its total fall 1600 feet, and the area of its drainage basin 14.55 square miles. Big Branch is its main tributary. Except along the lower 1½ miles of its course where there are rather wide bottom lands, most of its valley is narrow and restricted.

Poundmill Run.—Poundmill Run, a western tributary, rises against Rich Mountain at an elevation of 2680 feet, flows eastward, and empties into Tygart River 1½ miles above Lee Bell. Its total length is 2.4 miles, its total fall 630 feet, and the area of its drainage basin 2.04 square miles.

Elkwater Fork.—Elkwater Fork, a western tributary, heads in the sink-hole region southeast of Monterville at an elevation of 3240 feet, flows northward and northeastward, and empties into Tygart River about one mile below Spangler. Its total length is 7.1 miles, its total fall 1090 feet, and the area of its drainage basin 13.64 square miles. Its principal tributaries are Mowry Run, Limekiln Run, and Stony Run. Most of its valley is rough, narrow, and thinly populated but there are certain areas of limestone land which are carefully cultivated.

Stewart Run.—Stewart Run, an eastern tributary, heads against Cheat Mountain south of Crouch Knob at an elevation of nearly 4000 feet, flows generally northwestward by a tortuous course, and empties into Tygart River one-half mile below Spangler. Its total length is 7.2 miles, its total fall 1840 feet, and the area of its drainage basin 10.82 square miles. Almost its entire valley is narrow and steep with few habitations, most of the territory being cut-over forest land.

Conley Run.—Conley Run, an eastern tributary, heads against Cheat Mountain near Snyder Knob at an elevation of about 3575 feet, flows northwestward through a narrow and restricted valley and empties into Tygart River two miles north of Valley Head. Its total length is 3.8 miles, its total fall 1300 feet, and the area of its drainage basin 5.00 square miles.

Ralston Run.—Ralston Run, a western tributary, heads against the northern base of Elk Mountain at an elevation of 3400 feet, flows eastward, northward, and northeastward, emptying into Tygart River one-half mile below Valley Head. Its total length is 5.8 miles, its total fall 1050 feet, and the area of its drainage basin 8.07 square miles.

Windy Run.—Windy Run, an eastern tributary, heads against Cheat Mountain south of Snyder Knob at an elevation of 3800 feet, flows northwestward through a narrow and restricted valley and empties into Tygart River at Valley Head. Its total length is 4.7 miles, its total fall 1470 feet, and the area of its drainage basin 6.85 square miles.

Logan Run.—Logan Run, an eastern tributary, heads in the foot-hills of Cheat Mountain three miles southeast of Valley Head at an elevation of nearly 3600 feet, flows generally westward, and empties into Tygart River 1½ miles south of Valley Head. Its total length is 2.8 miles, its total fall 1120 feet, and the area of its drainage basin 2.64 square miles.

Big Run.—Big Run, an eastern tributary, heads against Cheat Mountain just southwest of Ward Knob at an elevation of 3775 feet, flows generally westward through an extremely narrow and restricted valley, and empties into Tygart River one mile below Mingo. Its total length is 4.6 miles, its total fall 1225 feet, and the area of its drainage basin 4.12 square miles.

Buckhannon River.

Buckhannon River, which drains a portion of the western part of Randolph County, rises against Turkeybone Mountain 2½ miles south of Pickens at an elevation of about 3135 feet, flows generally northward, passing into Upshur County one mile south of Craddock and into Barbour 1½ miles southwest of Hall, and empties into Tygart River at Tygart Junction, Barbour County. Its total length is 58.7 miles, its total fall 1825 feet, and the area of its drainage basin 310 square miles, nearly one-fourth of its watershed being in Randolph County. From its source to Hampton, Upshur County, its course is rough and turbulent, being mostly in the Pottsville, but from Hampton to Century Junction, Barbour County, it is a smooth, placid stream, approaching base-level condition. From Century Junction to its mouth it again becomes rough, having a considerable fall. In its upper valley this river is formed by several large branches as will be hereafter described.

Left Fork of Buckhannon River.

Left Fork of Buckhannon River rises on the eastern side of Turkeybone Mountain 3½ miles southeast of Pickens at about 3515 feet, flows northward, passing into Upshur County one mile above Palace Valley, and thence northwestward, emptying into the parent stream at Alexander, Upshur County. Its total length is 15.4 miles, its total fall 1675 feet, and the area of its drainage basin 37.40 square miles. Its principal tributaries, partly or wholly in Randolph County, are Bearcamp Run, Lick Run, Lower Dry Run, Dry Run, Beech Run, and Phillips Camp Run. That portion of its drainage in Randolph County is now a cut-over wilderness with few habitations, certain mining settlements which were started when lumbering was in progress having now been abandoned.

Right Fork of Buckhannon River.

Right Fork of Buckhannon River, interpreted as the parent stream and therefore starting against Turkeybone Mountain 2½ miles south of Pickens at an elevation of about 3135 as above described, flows northward and northwestward, passing into Upshur County one mile south of Craddock and joining with Left Fork as above described at Alexander, Upshur County. Its total length is 14.5 miles, its total fall 1295 feet, and the area of its drainage basin 53.00 square miles. Its principal tributaries are Left Fork, Middle Fork, Hell Run, Devil Fork, and Marsh Fork.

Left Fork (of Right Fork).—Left Fork of Right Fork rises against Turkeybone Mountain about two miles east of Pickens at an elevation of 3200 feet, flows northward to the Upshur County line which is crossed one mile north of Czar, and thence westward, emptying into main Right Fork of Buckhannon River at Newlonton. Its total length is 10.7 miles, its total fall 1300 feet, and the area of its drainage basin 18.15 square miles. Its principal tributaries are Trout Run, [illegible] Trout Run, and Anderson Camp Run.

Middle Fork (of Right Fork).—Middle Fork of Right Fork, rises one-half mile east of Fairview at an elevation of 2800 feet, flows northward, and empties into main Right Fork of Buckhannon River at the Randolph-Upshur line just south of Newlonton. Its total length is 4.1 miles, its total fall 800 feet and the area of its drainage basin 7.17 square miles. Its principal tributaries are See Shanty Run and Hooker Run.

Devil Fork.—Devil Fork, a western tributary, rises 2½ miles northwest of Pickens at an elevation of 2755 feet, flows northward, and empties into Right Fork of Buckhannon River at Arvondale Junction. Its total length is 2.8 miles, its total fall 535 feet, and the area of its drainage basin 2.38 square miles.

Marsh Fork.—Marsh Fork, a western tributary, rises 1½ miles southwest of Pickens at an elevation of 3100 feet, flows northward, and empties into Right Fork of Buckhannon River one-half mile above Silica. Its total length is 4.5 miles, its total fall 700 feet, and the area of its drainage basin 4.34 square miles.

Middle Fork River.

Middle Fork River drains a considerable portion of the western part of Randolph County, as well as portions of Upshur and Barbour. It rises on the western slope of Rich Mountain three miles southeast of Hartridge, Randolph County, at an elevation of 3710 feet, and flows northward to Cassity and thence northwestward to the Randolph-Upshur County line one-half mile south of Gale. Here it unites with Right Fork which is a much smaller stream and lies almost wholly in Upshur County, and then flows generally northward, forming the Randolph-Upshur line to Lantz and the Barbour-Upshur line to Audra and then flowing wholly in Barbour until it unites with Tygart River at Middle Fork Station. Throughout its entire length its channel is almost entirely in the hard rocks of the Pottsville Series, being generally rough, turbulent, and littered with huge boulders. Most of that portion of its watershed in Randolph County is still wooded, there being certain areas of virgin forest still standing. Its total length from head to mouth is 38.9 miles, its total fall 2220 feet, and the area of its drainage basin 151 square miles. Its principal tributaries in Randolph County are Devil Run, Hell Run, Laurel Creek, Kettle Run, Long Run, Cassity Fork, Three Forks Run, Stonecoal Run, Laurel Run, Laurel Branch, Schoolcraft Run, [illegible], and Mitchell Lick Fork.

Devil Run.—Devil Run, an eastern tributary, rises in Randolph County one-half mile south of Kingsville Station at an elevation of about 2255 feet, flows northwestward and empties into Middle Fork River in the edge of Barbour County 1.3 miles below Lantz. Its total length is 2.3 miles, its total fall 450 feet, and the area of its drainage basin 2.28 square miles.

Hell Run.—Hell Run, an eastern tributary, rises one-half mile south of Kingsville Post-Office, Randolph County, at an elevation of 2310 feet, flows northwestward mainly in this county but empties into Middle Fork River in the edge of Barbour County one-half mile below Lantz. Its total length is 3.0 miles, its total fall 500 feet, and the area of its drainage basin 2.14 square miles.

Laurel Creek.—Laurel Creek, an eastern tributary lying entirely in Randolph County, rises one-half mile southwest of Pumpkintown at an elevation of 2430 feet, flows northwestward and empties into Middle Fork River at Burnt Bridge. Its total length is 4.7 miles, its total fall 600 feet, and the area of its drainage basin 8.20 square miles. Brook Run is its principal tributary.

Right Fork.—Right Fork, a western tributary emptying into the main Middle Fork one-half mile above Gale, lies almost wholly in Upshur County and is described in the report for that county, page 56, as having a drainage basin of 31 square miles.

Kettle Run.—Kettle Run, an eastern tributary, rises 1½ miles southwest of Pumpkintown at an elevation of 2650 feet, flows northwestward, and empties into Middle Fork River at Kettle Run School. Its total length is 2.4 miles, its total fall 800 feet, and the area of its drainage basin 2.63 square miles.

Long Run.—Long Run, a western tributary, rises near See Camp Gap 2½ miles northwest of Adolph at an elevation of 3150 feet, flows almost due northward by an unusually straight course, and empties into Middle Fork River four miles northwest of Cassity. Its total length is 8.0 miles, its total fall 1275 feet, and the area of its drainage basin 8.79 square miles. Its main tributary is Hier Lick Run.

Cassity Fork.—Cassity Fork, an eastern tributary, rises against the western slope of Rich Mountain five miles east of Cassity at an elevation of 3360 feet, flows generally westward, and empties [illegible] Middle Fork River at Cassity. Its [illegible] length is 6.0 miles, its total fall 1350 feet, and the area of its drainage basin 16.20 square miles. Its principal tributaries are Panther Run on the south with a drainage basin of 4.24 square miles and Mulberry Fork on the north with a drainage basin of 1.75 square miles. Practically the entire watershed of Cassity Fork consists of cut-over woodland, there being few habitations and very little tillable land.

Three Forks Run.—Three Forks Run, a western tributary, rises one mile southeast of Loda at an elevation of 3025 feet, flows northeastward, and empties into Middle Fork River one-half mile above Cassity. Its total length is 2.9 miles, its total fall 1000 feet, and the area of its drainage basin 2.72 square miles. Its lower valley is utilized for the mining plants of the Three Forks Coal Company.

Stonecoal Run.—Stonecoal Run, an eastern tributary, rises against Rich Mountain three miles northeast of Adolph at an elevation of 2975 feet, flows northwestward, and empties into Middle Fork River 1½ miles above Cassity. Its total length is 2.8 miles, its total fall 900 feet, and the area of its drainage basin 3.10 square miles. Its watershed is rough, with few habitations and little tillable land.

Laurel Run.—Laurel Run, a western tributary, rises 2½ miles northwest of Adolph at an elevation of 3135 feet, flows eastward, and empties into Middle Fork River two miles below Adolph. Its total length is 2.8 miles, its total fall 930 feet, and the area of its drainage basin 2.16 square miles. Its watershed is rough and practically uninhabited except near the mouth of the stream.

Laurel Branch.—Laurel Branch, an eastern tributary, rises on a high shelf between Rich Mountain and Nettle Mountain, five miles northeast of Adolph at an elevation of 3050 feet, flows southwestward between these ridges for one mile and then turns westward, reaching Middle Fork River 1.7 miles below Adolph. Its total length is 3.8 miles, its total fall 840 feet, and the area of its drainage basin 3.46 square miles. Along its lower waters there is a narrow valley which is used for farming and farther up, toward the gap of Rich Mountain, there is another settlement where considerable coal mining for local domestic supply in the neighboring Tygart Valley has long been practiced.

Schoolcraft Run.—Schoolcraft Run, a western tributary, heads near [illegible] Camp Gap two miles north of Blue Rock at an elevation of 3160 [illegible] [illegible] eastward, and empties into Middle Fork River one-half mile below [illegible]. Its total length is 2.8 miles, its total fall 900 feet, and the area of its drainage basin 3.14 square miles. Its principal tributary is Birch Fork. So far as known its watershed, consisting of rough cut-over land, is uninhabited.

Birch Fork.—Birch Fork, a western tributary, rises against Rocky Ridge 3½ miles south of Blue Rock at an elevation of 3450 feet, flows generally northeastward, and empties into Middle Fork River at Adolph. Its total length is 6.3 miles, its total fall 1150 feet, and the area of its drainage basin 9.75 square miles. Most of its watershed consists of rough, wooded, and uninhabited land, there being a small settlement on one of its tributaries near Blue Rock.

Mitchell Lick Fork.—Mitchell Lick Fork, a western tributary, heads at the foot of the Big Laurel Thicket 2½ miles south of Adolph at an elevation of 2950 feet, flows northward, and empties into Middle Fork River just above Adolph. Its total length is 2.5 miles, its total fall 600 feet, and the area of its drainage basin 1.50 square miles, its valley being extremely narrow with no tributary streams.

Elk River.

Elk River, which drains a portion of the southern end of Randolph County, heads against Red Lick Mountain, Pocahontas County, at an elevation of about 4000 feet, flows northward through Pocahontas for 10 or 12 miles, entering Randolph four miles below Slaty Fork town. For the next 4½ miles its course is still northward but at the mouth of Valley Fork it turns southwestward and so continues for slightly more than two miles to Whitaker Falls. Here it enters Webster County and continues southwestward or westward to Webster Springs, thence generally northwestward to Sutton, Braxton County, beyond which it turns southwestward, flowing across Clay County and emptying into the Great Kanawha River at Charleston, Kanawha County. Its total length is approximately 172 miles, the distance from its head to Dry Fork being 15 miles and from Dry Fork to Whitaker Falls 7 miles. At the Pocahontas-Randolph line its elevation is 2475 feet, at Whitaker Falls where it enters Webster it is 2165 feet (2150 feet below the falls), at Webster Springs it is 1440 feet, and at Charleston 565 feet. Its total fall from head to mouth is 3435 feet, and the area of its drainage basin as figured in the Braxton and Clay Report of the Survey is 1550 square miles. In Randolph County its course is between extremely steep mountain slopes which generally approach 2000 feet in height and its valley is usually narrow, there being occasional bottoms. From the mouth of

Dry Fork to Valley Fork its channel is in the upper portion of the Greenbrier Series and its flow is intermittent, there being little surface water except at times of flood. At the mouth of Valley Fork its water bubbles up from the limestone and thereafter its flow is on the surface. The area of its drainage basin above but not including Back Fork which empties at Webster Springs is 172.66 square miles; that portion above Whitaker Falls is 102.85 square miles; and the portion above and including Dry Fork is 75.64 square miles. In addition to Back Fork which empties at Webster Springs its principal tributaries in Randolph County are Hickorylick Run, Valley Fork, Chimney Rock Run, Rough Gap Run, Falling Spring Run, and Dry Fork, most of the latter being in Pocahontas County.

Back Fork.—Back Fork, a northern tributary, rises in Randolph County near the Whitman Knob at an elevation of about 3500 feet, flows southwestward into Webster County and empties into Elk River at Webster Springs. Its total length from head to mouth is 24.3 miles, its total fall 2060 feet, and the area of its drainage basin 71.12 square miles. Most of its watershed consists of cut-over woodland, there being few bottoms and few habitations except toward its mouth in Webster County. The principal tributary is Sugar Creek which rises in Randolph County against Turkeybone Mountain and empties into Back Fork at Skelt, Webster County, its total length being 11.0 miles, its total fall 1560 feet, and the area of its drainage basin 23.29 square miles. Other tributaries in Randolph County, with their respective drainage basins, are: Big Run, 3.48 square miles; Flint Run, 1.89 square miles; Mitchell Run, 1.79 square miles; Hewett Fork, 2.65 square miles; and Vandevender Fork, 3.88 square miles.

Leatherwood Creek.—Leatherwood Creek, a southern tributary rises in Randolph County against Gauley Mountain at an elevation of 3850 feet, flows westward into Webster County and thence northwestward emptying into Elk River at Bergoo. Its total length is eight miles, its total fall 2050 feet, and the area of its drainage basin 19.80 square miles. Its principal tributary is Right Fork with a drainage basin of 7.37 square miles.

Bergoo Creek.—Bergoo Creek, a southern tributary heads in Randolph County against Gauley Mountain at an elevation of 3750 feet, flows northwestward into Webster County and thence westward, emptying into Elk River 1½ miles above Bergoo village. Its total length is 6½ miles, its total fall

1875 feet, and the area of its drainage basin 11.73 square miles. Almost its entire watershed is uninhabited.

Hickorylick Run.—Hickorylick Run, a northern tributary, rises against Point Mountain at an elevation of 3250 feet, flows southwestward, and empties into Elk River 1½ miles above Whitaker Falls. Its total length is 2.0 miles, its total fall 1275 feet, and the area of its drainage basin 2.18 square miles.

Valley Fork.—Valley Fork, a northern tributary, rises at the eastern base of Elk Mountain two miles south of Monterville at an elevation of 3000 feet, flows northward and westward, and empties into Elk River 2½ miles above Whitaker Falls. Its total length is 3.7 miles, its total fall 750 feet, and the area of its drainage basin 8.26 square miles. Its principal tributary is Mudlick Run with a drainage basin of 2.64 square miles.

Chimney Rock Run.—Chimney Rock Run, a southern tributary, rises against the eastern side of Gauley Mountain at an elevation of 4000 feet, flows northward and northeastward, emptying into Elk River two miles above Valley Fork. Its total length is 2.6 miles, its total fall 1650 feet, and the area of its drainage basin 1.96 square miles.

Rough Gap Run.—Rough Gap Run, a northern tributary, heads against the southern slope of Elk Mountain at an elevation of 3400 feet, flows southwestward through a narrow defile, and empties into Elk River at Swacker School. Its total length is 1.6 miles, its total fall 1000 feet, and the area of its drainage basin 1.43 square miles.

Falling Spring Run.—Falling Spring Run, a northern tributary, heads between Elk Mountain and Mingo Knob at an elevation of 3300 feet, flows westward, and empties into Elk River 0.6 mile below the Randolph-Pocahontas County line. Its total length is 1.8 miles, its total fall 850 feet, and the area of its drainage basin 1.43 square miles.

Dry Fork.—Dry Fork of Elk heads in Pocahontas County just south of Mace at an elevation of 3550 feet, flows generally westward, and joins with Old Field Fork to form Elk River at the Randolph-Pocahontas line. Its total length is 5.2 miles, its total fall 1070 feet, and the area of its drainage basin 10.25 square miles. Its channel is in the Greenbrier Series and for a considerable portion of the way is almost entirely dry. Its principal tributary is Douglas Fork on the north, having a length of 2.0 miles and a drainage area of 2.33 square miles.

Gauley River.

Gauley River, certain tributaries of which drain the extreme southern tip of Randolph County, has been previously described by the writer in the Webster Report, pages 37-47, and in the Nicholas County Report, pages 26-54, its length from head to mouth being 104 miles and the area of its drainage basin 1350 square miles. The main river is formed by three forks which join near the Webster-Randolph County line.

North Fork.—North Fork of Gauley River heads in Pocahontas County one-half mile west of Sharp Knob at an elevation of 4000 feet, flows southwestward 1½ miles and thence westward 1½ miles to the Pocahontas-Randolph line and thence southwestward two miles across Randolph County and joins South Fork in the adjacent edge of Webster County. Its total length is five miles, its total fall 1140 feet, and the area of its drainage basin 6.78 square miles.

Middle Fork.—Middle Fork of Gauley River heads in Pocahontas County one mile north of Buck Knob at an elevation of 3750 feet, flows northwestward, and joins with North Fork in Randolph County 0.4 mile above the junction of the latter with South Fork. Its total length is 2.7 miles, its total fall 850 feet, and the area of its drainage basin 3.77 square miles.

South Fork.—South Fork of Gauley River heads in Pocahontas County north of Turkey Mountain at an elevation of 3900 feet, flows northwestward across the southern tip of Randolph, and joins North Fork in the edge of Webster County. Its total length is 2½ miles, its total fall 1040 feet, and the area of its drainage basin 2.95 square miles.

Shavers Fork of Cheat River.

Shavers Fork of Cheat River, which drains a long belt through the central portion of Randolph County, rises in Pocahontas County just north of the Thorny Flat at an elevation of 4500 feet, and flows northward for nine miles, entering Randolph County two miles above Hopkins; and thence northeastward for approximately 30 miles, air-line measure, to the mouth of Wilson Run 1¼ miles above and southeast of Bowden. Here it turns suddenly westward for the next five miles, cutting a magnificent gap between Cheat Mountain and McGowan Mountain. Just below Lumber it turns northward again for three miles and thence northeastward, preserving this approximate course to its mouth. Just below

Pettit it crosses the Randolph-Tucker County line and just below Parsons in the latter county it unites with Dry Fork to form the main Cheat River.

For almost its entire length Shavers Fork is a rough and turbulent stream having occasional low cataracts and having few bottom lands of consequence above Bemis. From Bemis to its mouth there are occasional bottom lands interrupted by many narrows. Its watershed is sparsely populated being largely cut-over land. Above Bemis there are small settlements at Cheat Bridge, Hopkins, and Spruce but otherwise this portion of the valley is uninhabited. Below Bemis there are various small villages and occasional farms. Its total length is 83.4 miles, its total fall 2875 feet, and the area of its drainage basin 213 square miles. Throughout its entire length there are numerous entrenched meanders indicating a former base-leveled condition which is now entirely changed as shown by its average fall of 34.47 feet per mile. From Bemis to its head it is a distinctly upland valley, bounded on the west by Cheat Mountain and having a much higher elevation than the neighboring Tygart Valley; and being bounded on the east by Shavers Mountain and Back Allegheny Mountain and having its bed several hundred feet above the valley of Greenbrier River. From Bemis northward its channel cuts rapidly into the Mauch Chunk Series and from Faulkner to its mouth cuts into the Upper Devonian, making a deep and picturesque valley.

Since 1922 the West Virginia Power and Transmission Company has maintained gaging stations at Cheat Bridge and Bemis. The records of these stations as furnished by the company to the Water-Resources Branch of the United States Geological Survey will be found in Chapter XII under the subject of "Water-Power".

The principal Randolph County tributaries of Shavers Fork, in ascending order, are Pheasant Run, Nail Run, Boar Run, Little Black Fork, Clifton Run, Rattlesnake Run, Johns Run, Walker Run, Bickle Run, Taylor Run, Collett Gap Run, Upper Pond Lick, Red Creek, Fishinghawk Creek, Red Roaring Run, Red Run, Falling Run, Stalnaker Run, Suter Run, McGee Run, Yokum Run, Crouch Run, Glade Run, Whitmeadow Run, Stonecoal Run, Red Run, Blister Run, Fish Hatchery Run, Lambert Run, First Fork, Black Run, and Beaver Creek.

Pheasant Run.—Pheasant Run, a western tributary, of which a portion of the drainage is in Randolph County, heads in Tucker County 2½ miles northeast of Kerens at an elevation of 2200 feet, flows northwestward, and empties into

Shavers Fork two miles above Porterwood. Its total length is 3.5 miles, its total fall 475 feet, and the area of its drainage basin 7.94 square miles. Its bottoms and lower hillsides are used for farming.

Nail Run.—Nail Run, a western tributary, heads in Tucker County 1.3 miles northwest of Pettit at an elevation of about 2500 feet, flows northeastward across the Tucker-Randolph line, and empties into Shavers Fork one-half mile due south of Pettit. Its total length is 1.6 miles, its total fall 650 feet, and the area of its drainage basin 0.95 square mile.

Boar Run.—Boar Run, a western tributary, heads two miles southwest of Pettit at an elevation of 2400 feet, flows southeastward, and empties into Shavers Fork two miles by air-line measure above Pettit. Its total length is 1.3 miles, its total fall 475 feet, and the area of its drainage basin 0.85 square mile.

Little Black Fork.—Little Black Fork, an eastern tributary, heads against the western slope of McGowan Mountain three miles northeast of Bickle Knob at an elevation of 3050 feet, flows generally northwestward, and empties into Shavers Fork 2½ miles above Pettit. Its total length is 4.1 miles, its total fall 1100 feet, and the area of its drainage basin 4.60 square miles. There is some evidence to indicate that one of its northern tributaries formerly flowed into Yellow Creek of Otter Creek and it is apparent that its headwaters will probably capture another section of this creek in the course of years. Its watershed is uninhabited.

Clifton Run.—Clifton Run, a western tributary, rises two miles east of Kerens at an elevation of 2500 feet, flows southeastward, and empties into Shavers Fork just above Little Black Fork or 2.7 miles above Pettit. Its total length is 3.2 miles, its total fall 550 feet, and the area of its drainage basin 2.52 square miles. Some of its bottoms and hillsides are used for farming.

Rattlesnake Run.—Rattlesnake Run, an eastern tributary, rises against McGowan Mountain 1½ miles northeast of Bickle Knob at an elevation of about 3300 feet, flows westward, northward, and finally northeastward, and empties into Shavers Fork 3½ miles above Pettit. Its total length is 4.3 miles, its total fall 1350 feet, and the area of its drainage basin 3.93 square miles. Except near its mouth its watershed is uninhabited.

Johns Run.—Johns Run, an eastern tributary, heads on the western slope of Bickle Knob at an elevation of 3500 feet, flows northwestward and empties into Shavers Fork 3.2 miles, air-line measure, below Lumber. Its total length is 2.5 miles, its total fall 1500 feet, and the area of its drainage basin 1.78 square miles.

Walker Run.—Walker Run, an eastern tributary, heads against Bickle Knob at an elevation of 3250 feet, flows westward, and empties into Shavers Fork 1½ miles below Lumber. Its total length is 1.6 miles, its total fall 1200 feet, and the area of its drainage basin 0.92 square mile.

Bickle Run.—Bickle Run, an eastern or northern tributary, heads against the eastern slope of Bickle Knob at an elevation of 3150 feet, flows southward, and empties into Shavers Fork just opposite Bowden. Its total length is 1.6 miles, its total fall 950 feet, and the area of its drainage basin 1.73 square miles. Its grade is uniformly steep.

Taylor Run.—Taylor Run, an eastern or northern tributary, heads between Middle Ridge and Shavers Mountain 2.6 miles northeast of Bowden at an elevation of 3100 feet, flows southwestward, and empties into Shavers Fork one-half mile above Bowden. Its total length is 2.8 miles, its total fall 880 feet, and the area of its drainage basin 3.93 square miles. Along its lower waters some farming is done but its watershed is generally rough. Its principal tributary is Stalnaker Run, entering from the northwest.

Collett Gap Run.—Collett Gap Run, an eastern tributary, rises against Shavers Mountain north of Collett Gap at an elevation of 3550 feet, flows southwestward and then northwestward, and empties into Shavers Fork one mile below Woodrow. Its total length is 1.6 miles, its total fall 1250 feet, and the area of its drainage basin 1.21 square miles.

Upper Pond Lick.—Upper Pond Lick, a western tributary, heads between Pond Lick Mountain and Cheat Mountain at an elevation of 3500 feet, flows southeastward through a narrow and mostly uninhabited valley, and empties into Shavers Fork at Flint. Its total length is 2.8 miles, its total fall 1100 feet, and the area of its drainage basin 2.86 square miles.

Red Creek.—Red Creek, a western tributary, heads against Cheat Mountain at an elevation of 3750 feet, flows southeastward and then northeastward, and empties into Shavers Fork one-fourth mile above Flint. Its total length is 2.0 miles, its total fall 1350 feet, and the area of its drainage basin 1.27 square miles. Most of its drainage is rough but there is a little cultivated land near the mouth.

Fishinghawk Creek.—Fishinghawk Creek, a western tributary, heads on a high plateau just east of Cheat Mountain 2½ miles southwest of Bemis at an elevation of 3710 feet, flows generally northeastward by a tortuous course and then eastward, and empties into Shavers Fork just below Bemis. Its total length is 3.6 miles, its total fall 1150 feet, and the area of its drainage basin 4.83 square miles. A northern branch, nearly as large as the main stream, empties one mile west of Bemis. The entire watershed of this creek is uninhabited and extremely rough but in the past few years coal mining has been undertaken along the lower mile of the valley, being hauled to the railroad at Bemis by tram.

Red Roaring Run—Red Roaring Run, a western tributary, rises on the high plateau of Cheat Mountain 3½ miles southwest of Bemis at an elevation of 3750 feet, flows eastward through a channel which is extremely rough and precipitous along the lower course, and empties into Shavers Fork two miles above Bemis. Its total length is 2.1 miles, its total fall 1000 feet, and the area of its drainage basin 1.97 square miles.

Red Run.—Red Run, a western tributary, heads on the high plateau of Cheat Mountain three miles southwest of Bemis at an elevation of 3775 feet, flows eastward, and empties into Shavers Fork 3½ miles above Bemis. Its total length is 1.5 miles, its total fall 875 feet, and the area of its drainage basin 1.21 square miles. Its watershed is rough and uninhabited.

Fall Run.—Fall Run, a western tributary, rises on the high plateau of Cheat Mountain 5½ miles southwest of Bemis at an elevation of 3700 feet, flows southeastward and northeastward, and empties into Shavers Fork four miles above Bemis. Its total length is 2.6 miles, its total fall 780 feet, and the area of its drainage basin 2.88 square miles. A considerable tributary enters from the north which, together with the parent stream, is rough and uninhabited.

Stalnaker Run.—Stalnaker Run, a western tributary, heads on the plateau of Cheat Mountain about one-half mile north of the Harper Trail at an elevation of 3600 feet, flows southeastward, and empties into Shavers Fork six miles by air-line measure above Bemis. Its total length is 1.6 miles, its total fall 525 feet, and the area of its drainage basin 1.21 square miles.

Suter Run.—Suter Run, a western tributary, rises on the plateau of Cheat Mountain 1½ miles south of the Harper

Trail at an elevation of 3650 feet, flows southeastward and eastward, and empties into Shavers Fork about 7½ miles above Bemis. Its total length is 1.7 miles, its total fall 500 feet, and the area of its fan-shaped drainage basin 2.71 square miles. Although covered with debris and uninhabited it is much less rough than other tributaries farther north toward Bemis.

McGee Run.—McGee Run, a western tributary, rises on the plateau of Cheat Mountain two miles south of the Harper Trail at an elevation of 3700 feet, flows southeastward, and empties into Shavers Fork nine miles above Bemis. Its total length is 1.9 miles, its total fall 380 feet, and the area of its fan-shaped and uninhabited drainage basin 2.38 square miles.

Yokum Run.—Yokum Run, a western tributary, rises against Cheat Mountain 4½ miles south of the Harper Trail at an elevation of 3900 feet, flows southeastward, and empties into Shavers Fork one-half mile below Linan Mine. Its total length is 2.7 miles, its total fall 400 feet, and the area of its uninhabited drainage basin 2.16 square miles. The topography of its valley is rather mild and open but the surface is boulder-strewn and rough.

Crouch Run.—Crouch Run, a western tributary, rises against Cheat Mountain 2½ miles west of Linan Mine at an elevation of 3950 feet, flows southeastward, and empties into Shavers Fork one-half mile by air-line measure above Linan Mine. Its total length is 2.8 miles, its total fall 530 feet, and the area of its drainage basin 2.87 square miles. Its valley is somewhat open although the surface is rough and the land uninhabited.

Glade Run.—Glade Run, an eastern tributary, heads against Shavers Mountain 2½ miles northeast of Cheat Bridge at an elevation of 3850 feet, flows northward, and empties into Shavers Fork four miles north of and below Cheat Bridge. Its total length is 2.6 miles, its total fall 425 feet, and the area of its rough and uninhabited drainage basin 2.19 square miles.

Whitmeadow Run.—Whitmeadow Run, a western tributary, rises against Cheat Mountain about three miles southwest of Linan Mine at an elevation of 3900 feet, flows southeastward and eastward, and empties into Shavers Fork 3.8 miles below Cheat Bridge by air-line measure. Its total length is 2.5 miles, its total fall 450 feet, and the area of its rough and uninhabited drainage basin 2.88 square miles.

Stonecoal Run.—Stonecoal Run, a western tributary, rises against Cheat Mountain 2½ miles north of Cromer Top at an elevation of 3850 feet, flows southeastward, and empties into Shavers Fork 1.8 miles below Cheat Bridge by air-line measure. Its total length is 2.6 miles, its total fall 330 feet, and the area of its uninhabited drainage basin 3.34 square miles.

Red Run.—Red Run, a western tributary, heads against Barton Knob of Cheat Mountain at an elevation of 3750 feet, flows northeastward and empties into Shavers Fork 1.6 miles below Cheat Bridge. Its total length is 2.5 miles, its total fall 225 feet, and the area of its drainage basin 3.86 square miles. A northern branch heads near Cromer Top and joins the main stream slightly below the point where the latter is crossed by the Staunton and Parkersburg Pike. The valley of Red Run is rough and uninhabited but owing to the presence of the pike is a favorite resort for campers and fishermen.

Blister Run.—Blister Run, an eastern tributary, heads in the wind-gap between Shavers Mountain and Back Allegheny Mountain at an elevation of 3700 feet, flows northwestward, and empties into Shavers Fork one-third mile below Cheat Bridge. Its total length is 1.8 miles, its total fall 160 feet, and the area of its drainage basin 2.11 square miles. Its valley is somewhat boggy and partly covered with a thick growth of a rare species of fir often known as blister pine.

Fish Hatchery Run.—Fish Hatchery Run, an eastern tributary, rises against Back Allegheny Mountain 3.2 miles southeast of Cheat Bridge at an elevation of 4300 feet, flows northwestward, and empties into Shavers Fork one mile above Cheat Bridge. Its total length is 2.8 miles, its total fall 850 feet, and the area of its rough and uninhabited drainage basin 3.20 square miles.

Lambert Run.—Lambert Run, a western tributary, heads against Cheat Mountain southwest of Barton Knob at an elevation of 4250 feet, flows southeastward and then eastward, and empties into Shavers Fork 1.7 miles above Cheat Bridge. Its total length is 2.9 miles, its total fall 680 feet, and the area of its rough and uninhabited drainage basin 3.15 square miles.

First Fork.—First Fork, an eastern tributary, rises against Back Allegheny Mountain in Pocahontas County four miles southeast of Hopkins at an elevation of 4100 feet, flows northward through a rough and uninhabited valley, and empties into Shavers Fork in Randolph County 3.2 miles below Hopkins. Its total length is 5.0 miles, its total fall 500 feet, and the area of its drainage basin 9.97 square miles. Several short branches enter from either side.

Black Run.—Black Run, a western tributary, rises against Crouch Knob at an elevation of 4150 feet, flows southeastward, and empties into Shavers Fork 1.7 miles below Hopkins. Its total length is 1.8 miles, its total fall 520 feet, and the area of its rough and uninhabited drainage basin 1.59 square miles.

Beaver Creek.—Beaver Creek, a western tributary, rises south of Ward Knob of Cheat Mountain at an elevation of 3950 feet, flows northeastward, and empties into Shavers Fork one mile above Hopkins. Its total length is 1.8 miles, its total fall 270 feet, and the area of its drainage basin 1.62 square miles.

Dry Fork of Cheat River.

Dry Fork of Cheat River, which together with Shavers Fork forms the main Cheat River just below Parsons, Tucker County, rises in Randolph County between Rich Mountain and Little Middle Mountain two miles northwest of Osceola at an elevation of 3800 feet. From this point it flows northeastward for about 18 miles, air-line measure, to the Tucker County line at the mouth of Red Creek, thence northward one mile with the Randolph-Tucker line, and thence westward two miles with the same line to Jenningston. From Jenningston to its mouth its course is generally northwestward and all within Tucker County, the air-line distance from Jenningston to the junction with Shavers Fork being 11½ miles. Its total length from head to mouth by the meanders of the stream is 40.3 miles, its total fall 2175 feet, and the area of its drainage basin 501.65 square miles. Its name is derived from the fact that for the first eight miles of its course above the mouth of Gandy Creek it is an intermittent stream, its present channel being mostly in the outcrop of the Greenbrier Series so that surface water is absent a considerable portion of the year. From the mouth of Gandy Creek to Parsons this condition does not prevail, although a considerable amount of limestone outcrops along its channel at various localities. From its head to Red Creek, its course is almost straight, there being no large meanders. Below Red Creek for several miles entrenched meanders are common but below Mill Run there are few bends of consequence. From its source to Jenningston there are occasional bottoms of fairly good size and the slopes of Rich Mountain on the west and of the varied topographic features which form its eastern side, including Little Middle Mountain and Allegheny Mountain, are fairly smooth and fertile although steep and high. This region supports a considerable farming population mostly engaged in the raising of cattle and sheep. From Jenningston to Hendricks the topography is quite rough and forbidding, with few bottoms and with little attempt at farming except along the high Greenbrier shelf on the eastern side between Red Creek and Moore Station. From Hendricks to its mouth there are wide bottoms but the mountains remain high and rough.

The principal tributaries lying wholly or partly within Randolph County, in ascending order, are: Otter Creek, Glady Fork, Laurel Fork, Red Creek, Spruce Run, Horsecamp Run, Tony Camp Run, Stinking Run, and Gandy Creek. No stream-gaging stations have been maintained along the main channel of Dry Fork, but records have been secured on Glady Fork, Laurel Fork, and Gandy Creek as will be later described.

Otter Creek.—Otter Creek, a western tributary, rises in Randolph County two miles north of Bowden at an elevation of 3650 feet, flows northeastward, northwestward, and eastward between McGowan Mountain on the west and Shavers Mountain on the east, and empties into Dry Fork 2½ miles above and southeast of Hendricks, Tucker County, the last five miles of its course being in the latter county. Its total length is 13.0 miles, its total fall 1880 feet, and the area of its drainage basin 28.87 square miles, the portion above the Randolph-Tucker line being 17.45 square miles. Its entire watershed is rough and forbidding, consisting almost entirely of cut-over woodland with few bottoms and few habitations and traversed only by the foot trails of the Monongahela National Forest. Its principal tributaries, in ascending order and with their respective drainage basins, are: Moore Run, 3.40 square miles; Possession Camp Run, 2.20 square miles; Devils Gulch, 2.39 square miles; Harper Run, 0.96 square mile; Yellow Creek, 1.40 square miles; and Condon Run, 1.60 square miles, all of these being in Randolph County. Condon Run is regarded as the source of Otter Creek since it is the longest tributary. Just above its mouth there is a low pass from Otter Creek to Taylor Run of Shavers Fork having an elevation of 3110 feet.

Glady Fork.—Glady Fork, a western tributary, heads in Randolph County against the western slope of Middle Mountain six miles south of Glady town at an elevation of 3600 feet, flows generally northward to Glady town and thence generally northeastward, and empties into Dry Fork at Gladwin, Tucker County, the last two miles or more of its course being in the latter county. Its total length from the source of East Fork to its mouth is 34.7 miles, its total fall 1670 feet, and the area of its drainage basin 65.34 square miles. From the junction of East Fork and West Fork at Glady town to its mouth at Gladwin, the general course of its valley between Shavers Mountain on the west and Middle Mountain on the east is almost straight, the maximum deviation from an air-line between the two points being less than one mile, but there are almost innumerable short entrenched meanders indicating a previously base-leveled condition. A very large portion of its watershed is uninhabited and traversed by few roads but there is an agricultural belt along the Greenbrier shelf on the lower slope of Shavers Mountain extending three or four miles north of Alpena and from Alpena southward to Glady. Evenwood and Glady, formerly devoted to the production of lumber, are the principal villages along its course. Its main tributaries, in ascending order and with their respective drainage basins, are: Panther Camp Run, 1.89 square miles; Five Lick Creek, 1.25 square miles; Low Gap Run, 1.7 square miles; Flannigan Run, 0.82 square mile; Nichols Lane Run, 2.08 square miles; McCray Creek, 1.48 square miles; Frazier Creek, 1.42 square miles; Daniels Creek, 3.79 square miles; West Fork, 6.37 square miles; and East Fork, 11.09 square miles. The watersheds of nearly all of these consist of uninhabited and cut-over woodland but along West Fork, which joins with East Fork at Glady and which is traversed by the Durbin Branch of the Western Maryland Railway, there is a considerable amount of cultivated farm land. Glady Fork derives its name from the wide glady bottoms which occur in the vicinity of and just below Glady town. For the last few years a gaging station has been maintained at Evenwood, the records of which will be supplied in Chapter XII under the subject of "Water-Power".

Laurel Fork.—Laurel Fork, a western tributary, rises in Randolph County 4½ miles southwest of Osceola at an elevation of 4000 feet, flows generally northeastward, and empties into Dry Fork at the Randolph-Tucker County line just west of Jenningston. Its total length is 32.1 miles, its total fall 1960 feet, and the area of its drainage basin 60.71 square miles. Its valley, lying mainly between Middle Mountain on the west and Rich Mountain on the east, is fairly straight and narrow, the distance from mountain to mountain being only about three miles, but in its lower half there are many short, entrenched meanders indicating a former base-leveled condition. A very large part of the valley consists of cut-over and uninhabited woodland but there is a small settlement near the former location of Wymer Post-Office where it is crossed by the Elkins-Franklin road and the ridge of Middle Mountain on the west is traversed by a county road for 12 or 14 miles from Jenningston southwestward. On the eastern side the Greenbrier shelf forms a belt of good grazing land along the entire length of Rich Mountain, although sparsely populated and mainly served by a horseback trail. Toward its head the valley is again crossed by the Glady-Osceola road, passable by automobile in the summer season. Immediately along Laurel Fork, however, there is no longitudinal wagon road at any point, the only means of travel being an abandoned railroad grade now used as a foot trail. From the Elkins-Franklin road southward there are occasional bottoms and the topography is not unduly rough but from this road northward to the mouth the country is rougher and there are few bottoms.

The principal tributaries of Laurel Fork, in ascending order and with the areas of their respective drainage basins, are: Snyder Run, 2.34 square miles; Beaverdam Run, 2.47 square miles; Five Lick Run, 4.06 square miles; and Elk Run, 2.48 square miles. Some stream-gaging has been done on Laurel Fork near Wymer, the records of which will appear in Chapter XII, under the subject of "Water-Power".

Red Creek.—Red Creek, an eastern tributary, rises on a high plateau in Tucker County at the eastern base of Cabin Mountain four miles northeast of Cortland at an elevation of 4000 feet, flows southward four or five miles along this plateau, and thence southward and southwestward for 3½ miles with a rapidly descending and rugged channel to the Randolph-Tucker County line about one mile above Laneville, then turns westward and so continues with this county line to the junction of the creek with Dry Fork just below Dry Fork village. The watershed of Red Creek consists of a huge fan-shaped basin, lying partly between Cabin Mountain and Allegheny Front in the northern part and cut off on the south by the Red Creek Plains and Roaring Plains. From Laneville to the mouth there are rough and stony bottoms on which there is some attempt at cultivation and in the same section the Greenbrier shelves both north and south of the creek are mostly cleared and devoted to stock grazing, and sustain a scattered population. Elsewhere the topography is extremely rough and forbidding, mostly consisting of cut-over woodland or burnt-over barrens.

The total length of the creek is 16.6 miles, its total fall 1850 feet, and the area of its drainage basin 62.37 square miles. In ascending order and with their respective drainage areas the main tributaries in Randolph County are: Big Run, 3.32 square miles; Flatrock Run, 4.00 square miles; and South Fork, 8.95 square miles.

Spruce Run.—Spruce Run, an eastern tributary, heads against the Allegheny Front 3½ miles east of Harman at an elevation of 3700 feet, flows northwestward through a steep and rugged valley, and empties into Dry Fork 1.2 miles below Harman. Its total length is 3.3 miles, its total fall 1450 feet, and the area of its drainage basin 3.84 square miles.

Horsecamp Run.—Horsecamp Run, an eastern tributary, rises against the Allegheny Front 1½ miles east of Harperton at an elevation of 3350 feet, flows westward and northwestward and empties into Dry Fork at Harman. Its total length is 4.5 miles, its total fall 1000 feet, and the area of its drainage basin 7.76 square miles. Although hemmed in both to the north and south by high mountain spurs its watershed has a considerable amount of limestone land and supports a small population having access to Harman and the railroad by the Elkins-Franklin road.

Tony Camp Run.—Tony Camp Run, an eastern tributary, heads against the Allegheny Mountain range between Brierpatch Mountain and Job Knob at an elevation of 3500 feet, flows northwestward through a steep and narrow valley and empties into Dry Fork at Hazelwood. Its total length is 2.1 miles, its total fall 1050 feet, and the area of its drainage basin 2.65 square miles.

Stinking Run.—Stinking Run, an eastern tributary, rises against Allegheny Mountain south of Job Knob at an elevation of 3675 feet, flows southwestward and then northwestward, and empties into Dry Fork at Job. Its total length is 2.4 miles, its total fall 1100 feet, and the area of its drainage basin 1.96 square miles. Although hemmed in by steep mountain spurs a considerable portion of its watershed is limestone or red shale soil and devoted to grazing.

Gandy Creek.—Gandy Creek, an eastern tributary, heads against Allegheny Mountain in the extreme southeastern corner of Randolph County three miles southeast of Osceola at an elevation of 3900 feet, flows southward and northwestward to Osceola, then northeastward to Horton and then northwestward, and empties into Dry Fork 1.7 miles below Whitmer. Its total length is 18.6 miles, its total fall 1230 feet, and the area of its drainage basin 43.04 square miles. Its watershed above Osceola is mostly cut-over and uninhabited woodland but in the vicinity of Osceola there is a wide area of limestone and shale land which is devoted to grazing. Here there is a large sink-hole through which the creek flows for more than one-half mile, finally cutting an underground channel through a low limestone ridge and emerging one-half mile farther down. From Osceola to Horton the eastern side of the watershed is nearly all cut-over and uninhabited woodland but on the same side below Horton and Whitmer there is some limestone and shale land used for grazing. The same type of comparatively good land occurs on the western side of the valley along the slope of Little Middle Mountain, except that there are rough Pocono and Catskill outcrops immediately adjacent to the creek. This land is extensively grazed although having only a scanty population.

No tributaries of consequence enter Gandy Creek from the west but on the east the streams, in ascending order and with their respective drainage areas, are: Lower Two Spring Run, 1.50 square miles; Upper Two Spring Run, 1.48 square miles; Swallow Rock Run, 2.30 square miles; Big Run, 4.24 square miles; Grants Branch, 1.22 square miles; and Narrow Ridge Run, 1.31 square miles. Some stream-gaging records of Gandy Creek at Horton are available and will be found in Chapter XII under the subject of "Water-Power".

PART II.

Geology.

CHAPTER III.

GEOLOGIC HISTORY AND CORRELATION OF ROCKS.

DERIVATION OF SEDIMENTS.

The outcropping arenaceous rocks of Randolph County are entirely of sedimentary, or clastic, origin. They represent the broken and pulverized remains of still older rocks of the earth that have been slowly torn to bits, mainly by the agency of meteoric water, but also in part by atmospheric or chemical action, the whole process having been materially hastened by diastrophism which both wrinkled and crushed the ancient surface. From their original position these rock fragments have been transported long distances by prehistoric rivers that had their sources in an extensive highland, often called Appalachia for convenience, that is known to have existed in the vicinity of the present Atlantic seaboard and the region immediately westward, and that must have been of great height to afford the necessary gradient for carrying the sediments away. From this ancient land of high relief a vast quantity of rock debris was carried eastward and deposited in the Atlantic Ocean, forming what is known as the Continental Shelf, the composition and peculiarities of which are largely unknown because of its submergence. At the same time another large amount of material was carried westward and deposited in the ancient Appalachian Sea which, during certain periods at least, extended from the Gulf region northward into the present Canadian territory, its waters being comparatively shallow, with many large embayments of brackish or fresh constituents due to inflow from the rivers.

As the burden of deposited material in this old basin gradually increased, its floor subsided, allowing fresh sediments to cover those already made, and at times permitting the formation of limestones by the precipitation of calcareous matter from the sea water or by the accumulation of the shells of marine organisms. At the same time, no doubt, there were isostatic adjustments, aided by magmatic disturbances which raised new lands in the region of Appalachia and also uplifted portions of the newly formed beds just west of the highlands, affording further material for the old rivers to tear down and transport. This process of alternate uplift and erosion continued for well-nigh infinite ages until now the primeval mountains have been entirely degraded and only their stumps remain, these being deeply buried beneath a covering of more recent material in the Piedmont and Coastal Plain provinces; and the high ridges of Appalachia have moved slowly westward by successive upheavals, like the waves of an ocean, until they now occupy their present positions as part of the Appalachian Mountain system in the eastern locus of the ancient Appalachian Sea.

Some idea of the composition of ancient Appalachia may be gained by a study of the present arenaceous rocks. These have a predominant base of silica, mostly in the form of small grains of sand with occasional occurrences of various sized pebbles of quartz, jasper, and other silicates, the remainder of the stone being made up of particles of mica, finely divided feldspathic material, alumina, compounds of iron, and calcareous matter. Quartz, mica, and feldspar are the most common constituents of granite and by their abundance in the present rocks indicate the probable magma that must have composed the original core of Appalachia. Such calcareous matter as these clastic rocks now contain was probably derived in large part from the disintegration of limestone that accumulated in the eastern waters of the Appalachian Sea and that, from time to time, was elevated with the mountain ranges which developed long after the primary uplift.

In the present sandstones of Randolph County, especially in the Mauch Chunk Series, it is not uncommon to find basal conglomeratic zones in which there are fragments of limestone and shale with occasional vestiges of the marine organisms which shed light on the actual age of the degraded material. It is a common fact that neither limestone nor shale will stand continued attrition and exposure and hence it is evident that these instable fragments came from stratified beds somewhat older than the present rocks but much younger than the main bulk of the sandy matrix that comprised the early highland of Appalachia. They therefore represent a geographic zone of deposition that lay much farther west than the original mountains and not far from the present sandstones that contain them. Naturally, these beds of limestone and shale must have been elevated from their original plane to the western flank or perhaps the summit of some range that even now may still exist, and that must have been of great linear extent since the limestone and shale pebbles are not confined to this local area but continue for several hundred miles northeastward and southwestward along the strike of the Mauch Chunk rocks.

In the region southeast of the Mauch Chunk outcrops of Randolph County abundant limestone occurs in the Greenbrier Series, lying immediately under the Mauch Chunk, and they also occur in the Devonian, Silurian, and Ordovician rocks of still older age which do not outcrop in Randolph but which are successively exposed in Pendleton County, West Virginia, and in adjacent counties of Virginia. Positive evidence as to the group or groups from which these pebbles came is mostly lacking, as little study of their microscopic character has been made, but their abundance in certain localities would lead to the belief that much of the material may have come from the Greenbrier in closely contiguous territory. The adoption, or actual proof, of such a theory would naturally embrace the premise that the slope of erosion was in a neighboring range, since there is little evidence that any Greenbrier beds ever existed far to the southeastward, and would be in harmony with the belief that non-resistant pebbles could not have been carried far to sea.

The sum total of sediments now accumulated on the floor of the Appalachian Basin is variously estimated from 40,000 to 60,000 feet, consisting in part of the sandy remains of Appalachia, which by differential sorting of the fragments have been separated into sandy beds composed of the coarser quartzitic portions of the old granites, accumulated near the source of the waters or else much farther westward at times of excessive flow; and into shales composed of those portions in which alumina and the finer sand grains predominated, allowing them to be carried farther into the basin or to be deposited along its edge during periods in which the waters flowed gently.

The calcareous sediments, in which lime predominates and which form a very considerable amount of the surface rocks of Randolph County, are derived in part from the remains of vast quantities of animal organisms which flourished in the Appalachian Sea or in its shallow embayments of fresher water during periods in which degradation from Appalachia was not active and the waters were clear; and in part from the precipitation of calcareous matter which probably existed in the sea water and which therefore went directly into the limestone beds without going through the intermediate organic stage of shell formation. A large part of this material still remains approximately in its original position, but some portions have been transported for comparatively short distances and have been contaminated in part by mixture with sand or silt from the rivers of Appalachia.

A very small fraction of the surface rocks of Randolph County is composed of the coals, which represent the accumulation of vegetable matter that grew in extensive swamps during stages when the basin floor was elevated almost to the surface of the water, affording the peculiar condition in which plants might grow and at the same time be largely preserved from oxidation as the land gently subsided and as the waters became toxic to the forms of microscopic life which ordinarily prey on vegetable substance. A further more rapid subsidence caused these beds of vegetable remains to be buried under a mantle of sand and shale, thus preserving them in the form of peat until heat and pressure could gradually drive out the moisture and form coal. The principal coal beds of the county are found only in rocks of the Pennsylvanian Period which, in former times, probably covered the entire county but which now have been partly removed by erosion, leaving one large area in the Belington Syncline west of Tygart Valley and the adjacent region of Point Mountain and Gauley Mountain, leaving another in the North Potomac (Georges Creek) Basin along Shavers Fork and Otter Creek, and leaving a comparatively small remnant in the Job and Stony River Synclines in the northeastern corner of the county. In the Mauch Chunk and Pocono Series of the Mississippian Period there are occasional thin and impure seams of coal which indicate that conditions favorable to the formation of coal were not entirely lacking. A close study of these rocks in Randolph County, however, reveals no coal of economic value. In the Upper Devonian, also, there is abundant evidence of plant life but only occasional vestiges of carbonaceous material remain. The failure of this early vegetation to form coal may not be fully explained but it is certain that these old plants had only a trifling amount of foliage and it is possible that the trunks and branches were of such a pithy nature that disintegration occurred much more rapidly and easily than was the case with the Pennsylvanian flora.

CYCLES OF UPLIFT AND EROSION.

The arenaceous, calcareous, and carbonaceous beds of Randolph County, subsequent to their original deposition as above described, have been deformed, both during their periods of formation and in more recent times. As described under the subject of "Evolution of Mountain Forms", pages 29-32, four distinct major cycles of uplft and erosion have occurred in the county, the present cycle having partly advanced through the erosional phase. In addition to these major cycles there have been numerous intermediate stages of gentle uplift or depression which were not of sufficient size or duration to form mountains. Each coal bed, for instance, represents a definite stage of extremely shallow water, and there must have been consequent depression, or subsidence of the basin floor, allowing the carbonaceous material to be covered and preserved.

FAUNAL STAGES.

The oscillations of the early seas in the Appalachian Basin are reflected in the fossil life of the sediments deposited during the various periods of accumulation. Disregarding the Quaternary, or Alluvial, deposits which are of comparatively youthful age and entirely of fresh-water origin, and starting with the Pennsylvanian Period, the evidences of marine or aquatic life are few and scanty. In the Conemaugh Series, which in Randolph County is preserved only in the wilderness of the Roaring Plains, it is well known that there are certain rather persistent marine horizons but these are of trifling thickness compared to the main mass of the sediments and the fossil forms are not impressive. No study of their faunas was made in the county. In the Allegheny Series, which next underlies the Conemaugh, there is even less in the way of preserved animal life. No marine horizons were observed in Randolph County, but farther north in Maryland and in Pennsylvania the fossiliferous Vanport Limestone is described in the lower portion of the series and in northern West Virginia there are limestones which contain a scanty fresh-water or brackish-water fauna and at rare points small shells have been observed in the roof shales of the Lower Kittanning Coal. A more patient search might reveal some of these faunas in Randolph County. In the Pottsville Series, next underlying the Allegheny, the presence of marine fauna in certain shales and sandy limestones of the Kanawha Group farther southwest in the State is a matter of record. It is also well known that most of these faunas become scanty and largely disappear in passing northeastward across the State.

In Randolph County there are only a few recorded localities of Kanawha fossils and most of these are brackish-water types. Truly marine fossils have been observed still farther northeast, however, in Tucker and other counties, and they should be found by patient search in Randolph County. The New River Group, which in Randolph County comprises the lower half of the Pottsville, is generally quite barren of definitely marine forms in nearly all of the State but there are some rather persistent zones of brackish-water fossils in the roof shales of the Sewell and other coals and in a few instances, notably in the Point Mountain region of Webster County closely adjacent to Randolph, the writer has observed bonafide marine shells in the roof of the Sewell "B" Coal. In Randolph County at various points brackish-water zones have been observed, most prominent among which is the Hartridge Shale occurring just over the Sewell Coal at Hartridge.

In the Mississippian Period the county exhibits a fairly rich fauna. The Mauch Chunk Series at the top of the period is not nearly so interesting as its counterpart in southern West Virginia but its basal limestones and shales are definitely marine and at some localities can furnish rather abundant material for collection. Higher up in the series limestones are practically absent and the shales as a rule are barren, although occasional fossiliferous beds are found. The Greenbrier Series, next underlying the Mauch Chunk, is largely calcareous and definitely marine although practically barren of fossils at certain localities. There are many good collecting points in the county but the faunas generally are not so rich and varied as is the case in more southern counties. The Maccrady Series, next under the Greenbrier, is visible at only certain restricted localities in the southern end of the county and was not studied in much detail. It is mostly composed of red and purple shale without much paleontological implication but it is possible that there may be occasional calcareous beds and if so these should contain fossils. The Pocono Series, which is the basal group of the Mississippian in the county and which consists almost entirely of sandstone and shale, contains a central zone of richly fossiliferous rock, especially in the northern end of the county.

In the Upper Devonian the Catskill Series, which is the upper group, is mostly barren of marine fossils but in its upper portion there are occasional pelecypods and at certain localities fish plates and scales are rather abundant. The Chemung Series, next below the Catskill, is a vast storehouse of marine shells, its fossils being apparently more abundant and of greater variety in Randolph County than is the case in any other county in the State. These fossils generally occur in the sandy zones throughout the series, the interbedded shales being much less prolific. The Portage Series, next below the Chemung, is for the most part barren of marine fossils, its lack of such organisms being the principal feature which distinguishes it from the Chemung. In certain localities, however, it contains a few scattered shells. The Genesee Series, lying below the Portage and constituting the oldest outcropping rocks of the county and largely confined to the Leading Creek Valley, contains fairly abundant specimens of **Buchiola retrostriata** and **Styliolina fissurella**, its well-known guide fossils.

In Chapter V-VIII, inclusive, the stratigraphy of the above-named faunal stages, as determined by the writer, will be presented in detail, and in Chapter XV will be found the identifications and comment of Dr. John L. Tilton on the collections made by the writer in Randolph County.

FOSSIL FLORA.

In the Pennsylvanian Rocks there is, of course, an abundant and varied fossil flora, which has been studied in West Virginia and other Appalachian States by many noted authorities, including Dr. David White of the United States Geological Survey. In Randolph County no general study of the Pennsylvanian floras was made but several good collections in the lower part of the New River Group of the Pottsville and particularly in the roof shales of the Sewell Coal were made by Dr. David White and the writer, partly together and partly on separate trips. A full study of these collections has not yet been made by Dr. White but such of his work as is now available will be found in Chapter XIV.

In the Mauch Chunk, Greenbrier, and Pocono Series of the Mississippian there are some scattered and rather fragmentary floras in the county from which a few collections have been made by Dr. White and the writer. Such identifications as are available will be found in Chapter XIV.

In the Catskill, Chemung, and Portage Series of the Upper Devonian, Randolph County offers to the world an astoundingly rich flora for rocks of such early age. The discovery of fossil trees in the Chemung and Portage by the writer in the field season of 1926 has already been announced in a brief publication[1]. In the field season of 1927 these fossil tree localities were visited by Dr. David White in company with the writer and also a considerable study of the ferns and other plants of the Catskill, which is unusually rich in

[1]David B. Reger, The Tygart Valley Devonian Trees of West Virginia; Am. Jour. Sci., Vol. XV, No. 85, pp. 49-57; January, 1928.

such material, was made. The stratigraphic associations of these floras will be found in the sections and descriptions of the Devonian in Chapters V and VIII, and in Chapter XIV there is a brief discussion, but it has not yet been possible to make a detailed study and description of the collections. It is expected, however, that a more exhaustive and comprehensive publication on these floras by Dr. White and the writer will eventually appear.

PREVIOUS GEOLOGIC WORK.

Numerous general and special publications have been issued within the past century, sections and items of which are applicable to the geology, natural resources, history, and climate of Randolph County. These publications are summarized in the following bibliography, but the list is doubtless far from complete and apology is offered to writers who may have been overlooked. Water-Supply Papers of the United States Geological Survey, dealing with the rivers of the county, will be mentioned in Chapter XII under the subject of "Water-Power" and are not given in this list. In more recent years it will be noted that the Survey in 1918 published a Detailed Geologic Report on Barbour and Upshur Counties and the Western Portion of Randolph County by the writer assisted by D. D. Teets, Jr. This report embraced that portion of Randolph County west of Rich Mountain and the data on that area in the present volume is largely a repetition for the sake of convenience. It will also be noted that the Survey in 1928 published a preliminary report—Bulletin No. 3, The Cheat Mountain Coal Field of Randolph County, West Virginia—by the writer, in which the essential data on this new coal field was presented in greatly abbreviated form. Naturally the information therein contained has been incorporated into the present volume in a more detailed manner. The bibliography is as follows:

1840-1842.—Rogers, W. B. and H. D. On the Physical Structure of the Appalachian Chain, as Exemplifying the Laws which have Regulated the Elevation of Great Mountain Chains Generally. Transactions of the Association of American Geologists and Naturalists. (Reprinted in Geology of the Virginias, D. Appleton & Co., 1884, pp. 601-642.)

1843.—Rogers, H. D. An inquiry into the origin of the Appalachian Coal Strata, Bituminous and Anthracite. Transactions Association of American Geologists. 41 pp.

1850.—Rogers, H. D. On the Structural Features of the Appalachians, Compared with those of the Alps and other Disturbed Districts of Europe. Proc. American Association for the Advancement of Science, Vol. II, 5 pp.

1853.—Strother, D. H. The Blackwater Chronicle, a Narrative of an expedition into the Land of Canaan. By the Clerk of Oxenforde, D. H. Strother, 223 pp. New York.

1856.—**Lesley, J. P.** Manual of Coal and its Topography. Illustrated by original drawings, chiefly of facts in the geology of the Appalachian region of the United States, 224 pp., Philadelphia.

1865.—**Lesley, J. P.** Appalachian Structures. Proc. American Philosophical Society, Vol. IX, 14 pp., with plates.

1878.—**Stevenson, John J.** On the Surface Geology of Southwestern Pennsylvania and adjoining portions of Maryland and West Virginia. American Journal of Science, Vol. XV, 5 pp.

1891.—**White, I. C.** Stratigraphy of the Bituminous Coal Fields of Pennsylvania, Ohio, and West Virginia. U. S. Geological Survey, Bulletin 65, 212 pp.

1894.—**Weeks, Joseph D.** The Potomac and Roaring Creek Coal Fields in West Virginia. U. S. Geological Survey, Fourteenth Annual Report, 20 pp., with map.

1896.—**Darton, N. H.** Franklin Folio, No. 32, U. S. Geological Survey. Description of coal, iron, lime, stone, road-metal, and clay, with areal geology and cross-sections. Includes northeastern corner of Randolph County.

1896.—**Taff, J. A., and Brooks, A. H.** Buckhannon Folio, No. 34, U. S. Geological Survey. Description of coal, iron, lime, stone, road-metal, and clay, with areal geology and cross-sections. Includes part of western Randolph County.

1898.—**Maxwell, Hu.** History of Randolph County.

1899.—**White, I. C.** Levels, Meridians, Oil and Gas, Vol. I, W. Va. Geological Survey, 392 pp. Describes location of true meridian at Beverly.

1901.—**Brown, S. B.** Bibliography of Works upon the Geology and Natural Resources of West Virginia from 1737 to 1901. Bulletin No. 1, W. Va. Geological Survey, 85 pp.

1903.—**White, I. C.** Coal Report, Vol. II, W. Va. Geological Survey. General description of the coals of the State, including Randolph County, with sections, analyses, etc. 725 pp.

1904.—**Lewis, Virgil A.** Handbook of West Virginia. Published by West Virginia Commission of the Louisiana Purchase Exposition, 390 pp. History, natural resources, enterprises, and institutions (popular style).

1905.—**Grimsley, G. P.** Clays, Limestones, Cements, Vol. III, W. Va. Geological Survey, 565 pp. General study of these items in State, including Randolph County.

1908.—**White, I. C.** Supplementary Coal Report, Vol. II(A), W. Va. Geological Survey, 720 pp. Further sections, analyses, and comment on coals of State, including Randolph County.

1909.—**Grimsley, G. P.** Iron Ores, Salt, Sandstones, Vol. IV, W. Va. Geological Survey, 603 pp. General description of these items in State, including Randolph County.

1911.—**White, I. C.** Levels and Coal Analyses, Bulletin No. 2, W. Va. Geological Survey, 385 pp. Compilation of railroad and Government levels, and State coal analyses to date of publication.

1911.—**Brooks, A. B.** Forestry and Wood Industries. Vol. V, W. Va. Geological Survey, 500 pp. Describes these items in State, including Randolph County.

1913.—**Millspaugh, C. F.; and White, David.** Part I, Living Flora of West Virginia (Millspaugh); Part II, Fossil Flora of West Virginia (White). Vol. V(A), W. Va. Geological Survey, 491 pp. General description of these items for State, including Randolph County.

1918.—Hennen, Ray V. Figure Showing Bituminous Coal Beds in West Virginia. W. Va. Geological Survey. Etching.

1918.—Reger, David B. Geology of Barbour and Upshur Counties and the Western Portion of Randolph County. W. Va. Geological Survey, 867 pp. General geologic description of that portion of Randolph County west of Laurel Ridge and Rich Mountain, with maps, mine descriptions, analyses, etc.

1920.—Reger, David B. Geology of Webster County. W. Va. Geological Survey, 671 pp., with maps, including description of the southern wedge of Randolph County south of Elk River.

1921.—Reger, David B. Carbon Ratios of Coals in West Virginia Oil Fields. Trans. American Institute of Mining & Metallurgical Engineers, pp. 522-526. Discussion of carbon in coal with reference to occurrence of oil and gas.

1923.—Reger, David B. Geology of Tucker County. W. Va. Geological Survey, 542 pp., with maps, including some data in the northern edge of Randolph County.

1928.—Reger, David B. The Cheat Mountain Coal Field of Randolph County, West Virginia. W. Va. Geological Survey, 34 pp., with photolithographic map giving preliminary description of coals, location of prospects, analyses, and structure contours of North Potomac (Georges Creek) Coal Basin from Dry Fork River, Tucker County, through the Shavers Fork territory of Randolph and Pocahontas Counties.

NOMENCLATURE AND CORRELATION.

In Randolph County, as in many other regions, the problem of proper nomenclature and correlation of the rocks involves a selection from equivalent titles that have been employed in different regions for the same group of sediments. In the Pennsylvanian Period the nomenclature of the Second Geological Survey of Pennsylvania, in so far as it is applicable, and following that the amplified Pottsville nomenclature of southern West Virginia, as used in numerous Reports of the West Virginia Geological Survey, is necessarily followed. It is apparent that the names of various members, and in some cases of certain group names, are not entirely in harmony with those now used in adjacent States but such harmony will not be possible until much interstate work has been done and in the meantime the usage of the extensive literature on West Virginia is preserved.

In the Mississippian Period, as will be later discussed in more detail, the necessity of a choice between the distinct nomenclatures of the East and West is apparent. In general the rocks of this age correspond more closely with the formations of the same age in northeastern Pennsylvania than with their supposed counterparts in the Mississippi Valley. At the top the name of the Mauch Chunk Series is from Pennsylvania although it is known that this series is correlative in part with the Chester which is an older title. The

Chester of the West, however, has so little in common with the Mauch Chunk of Randolph County that its use would be clearly confusing. On the other hand the name of Mauch Chunk as first used in Pennsylvania applied not only to the red beds which are now commonly included under that title in West Virginia and Pennsylvania but also to the northeastern remnant of the Greenbrier Series. Very clearly the name of Trough Creek Limestone which was given to the attenuated fragment of this series in the Broad Top Basin can scarcely be made to apply to the great limestone series of the Greenbrier Valley of West Virginia. The Greenbrier, as used in West Virginia, is partly Chester, partly Meramec, and partly intermediate beds which appear to have no representation in the West and is a title that is of much value. Maccrady is a Virginia name which applies well to the tongue of red beds which extends northward into West Virginia and then disappears. The Pocono Series, forming the basal portion of the Mississippian Period in West Virginia, is directly traceable from northeastern Pennsylvania entirely across West Virginia and beyond. In lithology and general aspects the two regions are quite in harmony and their essential identity is hardly subject to doubt. It is also certain that the Pocono correlates closely with the Price Formation of Virginia and with the New Providence of Kentucky. Farther west there is less certainty although the calcareous Burlington is probably of much the same age.

In the Upper Devonian the exposed beds of Randolph County correlate quite clearly with the Catskill, Chemung, Portage, and Genesee of New York State, as carefully traced across Pennsylvania and Maryland to the Potomac River region of West Virginia. Clearly no improvement on these firmly fixed and widely used titles could well be made.

CLASSIFICATION OF OUTCROPPING ROCKS.

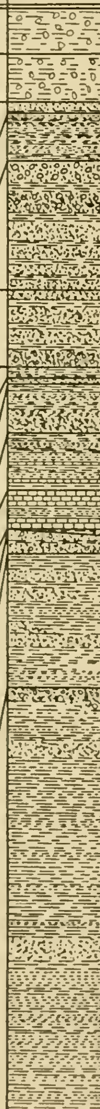
In Figures 4 and 5 will be found a general columnar section of the outcropping rocks of Randolph County, indicating the maximum and minimum thicknesses of all subdivisions of sufficient importance to be placed on the geologic map, together with brief descriptions of their most salient characteristics. The further and more minute subdivisions will be exhibited under the discussions of each series in Chapters VI-VIII, inclusive.

FIG. 4.

GENERAL COLUMNAR SECTION OF ROCKS EXPOSED OR OTHERWISE KNOWN IN RANDOLPH CO. WEST OF RICH MTN.

Scale. 1 Inch = 1000 Feet

Era	Period or System	Series	Map Sym.	Section	Thickness Feet	Total Feet	Description
QUATERNARY	Recent		Qal		?	?	Unconsolidated clays and gravel. (River wash)
QUATERNARY	Pleistocene		Qal		?	?	Unconsolidated clays and gravel (River terraces)
PALEOZOIC	Upper Carboniferous Pennsylvanian	Conemaugh (Part)	Ccm		0-50	50	Gray massive sandstone at top, dark or sandy shale at base
PALEOZOIC	Upper Carboniferous Pennsylvanian	Allegheny	Ca		225-250	300	Gray, massive coarse sandstone gray or dark sandy shales of fire clays, several good coals; abundant plant fossils.
PALEOZOIC	Upper Carboniferous Pennsylvanian	Pottsville Series: Kanawha Group	Ck		350-675	975	Gray massive, conglomeratic sandstone at top, gray, massive, coarse sandstones below; dark or sandy shales; several good coals occasional thin zones of marine fossils; abundant plant fossils.
PALEOZOIC	Upper Carboniferous Pennsylvanian	Pottsville Series: New River Group	Cnr		150-400	1375	Gray massive coarse sandstones in upper and middle portions; heavy conglomeratic sandstone at base, dark or sandy shales; several good coals; thin zones of fresh or brackish-water fossils, abundant plant life
PALEOZOIC	Lower Carboniferous Mississippian	Mauch Chunk Series: Bluestone Group	Cbl		25-50	1425	Mostly red shale with thin lenses of red or green micaceous sandstone.
PALEOZOIC	Lower Carboniferous Mississippian	Mauch Chunk Series: Princeton Conglom	Cpr		10-25	1450	Mostly green or red sandstone but occasionally conglomeratic
PALEOZOIC	Lower Carboniferous Mississippian	Mauch Chunk Series: Hinton Group	Chn		125-250	1700	Mostly red shale with red or green sandstones; heavy sandstone at base, occasional marine fossils; a few plant fossils.
PALEOZOIC	Lower Carboniferous Mississippian	Mauch Chunk Series: Bluefield Group	Cbf		140-300	2000	Red or green shales; red or green sandstone thin limestones; abundant marine fossils towards base, a few plant fossils; coal streaks.
PALEOZOIC	Lower Carboniferous Mississippian	Greenbrier	Cgr		100-200	2200	Mostly gray limestone, partly oolitic and usually divided by bed of red or sandy shale; abundant marine fossils; occasional plant stems.
PALEOZOIC	Lower Carboniferous Mississippian	Maccrady	Cmc		20-0	2200	Red or purple shale recorded in drill holes near Pickens
PALEOZOIC	Lower Carboniferous Mississippian	Pocono	Cpo		25-100	2300	Mostly gray or brown sandstone with thin gray or dark sandy shales abundant marine fossils, also plants.
PALEOZOIC	Devonian	Catskill	Dck		400-700	3000	Predominantly red or green shales with numerous lenticular red or green sandstones; fish remains and bi-valves near top; rather abundant plant fossils, mostly ferns (*Archaeopteris* and *Dimeripteris*) at exposures on eastern side of Rich Mountain
PALEOZOIC	Devonian	Chemung	Dch		2500+	5500	Upper part mostly olive-green sandy or argillaceous shale with thin sandstone flags and occasional heavier beds and a conglomerate at the top; middle part is mostly dull gray or brown sandstone with frequent beds of shale; lower part is mostly olive-green sandy or argillaceous shale with lenticular thin flagstones; abundant marine fossils and also plant stems at exposures on eastern side of Rich Mountain.



G.W.G.

FIG. 5.

GENERAL COLUMNAR SECTION OF ROCKS EXPOSED IN CENTRAL, EASTERN AND SOUTHERN RANDOLPH CO.

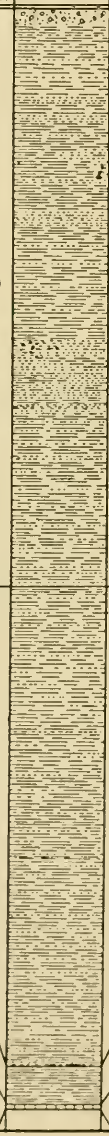
Scale: 1 Inch = 1000 Feet

Era	Period or System	Series		Map Sym.	Section	Thickness Feet	Total Feet	Description
QUATERNARY	Recent			Qal		?	?	Unconsolidated clays and gravel. (River wash)
QUATERNARY	Pleistocene			Qal		?	?	Unconsolidated clays and gravel. (River terraces)
PALEOZOIC	UPPER CARBONIFEROUS Pennsylvanian	Conemaugh (Part)		Ccm		150-175	175	Sandstones, dark or sandy or red shales and coals; a few marine fossil zones; plant fossils
		Allegheny		Ca		100-150	325	Gray massive coarse sandstones, dark or sandy shales; coals, plant fossils.
		POTTSVILLE Series	Kanawha Group	Ck		500-675	1000	Gray, massive conglomeratic sandstones at top; gray, massive coarse sandstones below, dark or sandy shales; coals; occasional thin zones of marine fossils, abundant plant fossils
			New River Group	Cnr		250-400	1400	Gray, massive coarse sandstones in upper and middle portions, heavy conglomerate sandstone at base, dark or sandy shales; several good coals; thin zones of fresh or brackish-water fossils, abundant plant fossils.
	LOWER CARBONIFEROUS Mississippian	MAUCH CHUNK Series	Bluestone Group	Cbl		100-300	1700	Mostly red or green shales with thin lenses of red or green, micaceous flaggy sandstones.
			Princeton Conglom.	Cpr		15-50	1750	Green or gray sandstone, often coarse and conglomeratic, with occasional plant fossils
			Hinton Group	Chn		200-400	2150	Mostly red or green shale with red or green sandstones; heavy sandstone at base; thin streaks of coal; occasional marine fossils; a few plant fossils
			Bluefield Group	Cbf		300-650	2800	Red or green shales; red or green sandstones, occasionally coarse and gray; dark or calcareous shales and limestones toward base with abundant marine fossils; a few plant fossils; coal streaks.
		Greenbrier		Cgr		200-400	3200	Dark siliceous limestone at top followed by gray oolite and zones of red shale and sandstone; gray siliceous oolite near middle; dark amorphous limestones in lower part with streaks of red shale; abundant marine fossils; a few plant fossils
		Maccrady		Cmcc		0-50	3250	Red or purple shale with sandy streaks.
		Pocono		Cpo		50-225	3475	Mostly gray or brown sandstone with thin gray or dark sandy shales; abundant marine fossils; also plants.
	DEVONIAN	Catskill		Dck		600-1200	4675	Red or green shales; reddish-brown or greenish-brown, micaceous and cross-bedded sandstone; fish remains and bi-valves near top; rather abundant plant remains, including ferns (Archaeopteris and Dimeripteris) and stems of trees.

G.W.G.

FIG. 5. (Concluded)

GENERAL COLUMNAR SECTION OF ROCKS EXPOSED IN CENTRAL, EASTERN AND SOUTHERN RANDOLPH CO.

Era	Period or System	Series	Map Sym.	Section	Thickness Feet	Total Feet	Description
PALEOZOIC	DEVONIAN (Continued)	Chemung	Dch		2500-3000	7675	Greenish-gray, conglomeratic sandstone (Hendricks) at top followed below by olive-green shales and olive-green or greenish-brown flagstones, zone of greenish-brown or reddish-brown sandstone (Valley Head) about 400 feet below top of series, followed below by alternating olive-green shales and flagstones; zone of greenish-brown shaly sandstone (Elkins) near middle of series; lower third of series composed of alternating olive-green shales and olive-green or greenish-brown flagstones; abundant marine fossils throughout series, mostly occuring in thin ferruginous or calcareous zones, with great numbers of Ambocoelia near Portage contact; small stems of trees in Hendrics sandstone; large tree trunks in Valley Head and Elkins sandstones.
		Portage	Dp		2000-2500	10175	Greenish-gray flagstones and greenish-gray, or dark sandy shales alternating throughout series; a very few marine fossils, numerous small stems or branches of trees in middle or lower part and occasional large stems.
		Genesee	Dg		150-198	10373	Black, bituminous, fissile shale, with occasional marine fossils.
		Genesee ? or Hamilton ?				10375	Dark concretionory or lenticular limestone (Landes) probably transitional. G.W.G.

CHAPTER IV.

STRUCTURE.

METHODS OF GEOLOGIC WORK AND REPRESENTATION OF STRUCTURE.

In determining the structure, or lay, of the rocks in Randolph County the same method of geologic work may not be applied with good results to the entire area. In that portion of the county lying west of Tygart Valley and Rich Mountain and farther south in the Point Mountain, Elk, and Gauley country, where the rocks have been only slightly disturbed and where the original strata are still approximately horizontal, there are numerous coals and other well-defined, undistorted, and easily recognized beds by which thicknesses may be measured and intervals and dips determined with great exactitude over wide areas and with such precision as circumstances may require, accuracy being limited mainly by the amount of time consumed and the instrumental methods employed.

In the valley of Shavers Fork and Otter Creek, also, the same conditions prevail to some extent, there being many coals which may be traced and other good key rocks which may be followed, although the dips are generally steeper than is the case in the coal rocks west of Tygart Valley and to that extent structural representation is necessarily less accurate.

In the two regions named a careful structure map has been made, showing the position of the base of the **Sewell (Sharon) Coal** of the New River Group of the Pottsville Series with respect to sea-level, this stratum being present and recognizable over a good portion of both areas and its theoretical position being possible of determination by observations on other coals in those localities where it is absent or where drill holes have not reached it. By this means the elevation of its base above sea-level is shown by **green structure contours** on Map II, and inasmuch as all other horizons lie approximately parallel to it the contours on this coal can be used to determine the position of any other stratum. In both these regions careful sections were measured at frequent localities, as recorded in Chapter V, the aneroid and hand-level being used to determine intervals, so that the structure could be projected farther west where the Sewell Coal is below drainage as is the case in the northwestern corner of the county.

In a former report on Barbour and Upshur Counties and the Western Portion of Randolph County, the portion of Randolph County west of Tygart Valley has been previously contoured by the writer on the horizon of the Lower Kittanning Coal of the Allegheny Series. The Lower Kittanning Coal, however, covers much less acreage in this territory than does the Sewell and hence it will be of more practical value to coal operators and other interested parties to have entirely new contours on the Sewell rather than to reproduce those on the Lower Kittanning, especially since the contouring of the latter is still available in the former publication.

In the Dry Fork Valley of the eastern portion of the county, extending from Laneville and Harman southward to Horton and Osceola, there is another basinal area in the northern end of which coals are still preserved but in the southern end of which their horizons lie above the tops of the mountains. For many reasons a structure map of this territory would be a desirable thing but if made on a coal seam it would cover only a comparatively small territory of actual coal outcrop and would have only conjectural application to the southern portion of the basinal area. On the other hand the top of the Greenbrier Limestone Series is almost everywhere above drainage and distinctly recognizable in this territory. Contours are therefore plotted on the top of the **Alderson Limestone** which is the top of the **Greenbrier Series,** for this region, the elevation of this horizon above sea-level in feet being shown by **red structure contours** on Map II. This limestone is below drainage in the Stony River Syncline east of Laneville but sections and tables of intervals are furnished to show the position of the coals with respect to its horizon in this locality. There is a possibility that some eventual economic use may be made of the limestones of the Greenbrier Series in the Dry Fork Valley and hence a careful delineation of their structural position is considered the best thing that could be put on Map II.

In the anticlinal region of Tygart Valley and Leading Creek, and in the similar region of Middle Mountain and the valleys of Glady Fork and Laurel Fork, the coals have been elevated to great heights and then eroded, and the same statement is for the most part true of the Greenbrier Series, its outcrop in these regions being confined to the flanks of the anticlines but not extending over their tops. Plainly neither the coals nor the limestones could be used for structural representation; and owing to the broken and distorted condition of the outcropping Devonian rocks contours plotted on these latter formations would be grossly inaccurate although the recognition of definite key rocks could be accomplished. In such a region a better picture of the structure may be obtained from graphic cross-sections and hence several of these have been plotted to scale and engraved on the margin of Map II. In various localities, also, where conditions were favorable, horizontal measurements were made across the dips to secure data for the computation of thicknesses by trigonometric methods, and the resulting sections, together with those vertically measured in regions where the rocks lie approximately horizontal, appear in Chapter V under the subject of "Measured Sections."

DETAILED STRUCTURE.

GENERAL FEATURES.

As mentioned above, the western portion of Randolph County has a comparatively gentle structure. In that respect it belongs primarily with the central and western portions of the State which are embraced by the broad expanse of the Appalachian Geosyncline, a great basin extending from western New York southwestward across western Pennsylvania, western West Virginia, eastern Kentucky, and on southward to Alabama. In the West Virginia portion of this basin, including the western part of Randolph County, the rocks have remained nearly horizontal through the agency of competent strata, capable of resisting in large measure the force of lateral thrust, there being many heavy sandstones of great compressive strength in the Pennsylvanian Rocks which cover the surface for many miles as well as in the Pocono Series farther down, while the intermediate Greenbrier Series is itself capable of much resistance.

Farther east in Randolph the folding has been rather severe and approaches, although it does not reach, the sharply uplifted and thrust-faulted character which is typical of much of the axial belt of the Appalachian Mountain System. It may not be safely assumed that, before folding and erosion began, the rocks of eastern Randolph were less competent than those farther west. It is rather to be supposed that the region suffered more severely on account of proximity to the force or forces that caused lateral thrust and uplift. It is in fact quite probable that the Pennsylvanian Rocks once extended entirely across the present limits of the county, as they are preserved generally as far southeast as the Allegheny Front and there is a remnant in Spruce Mountain, Pendleton County, which is apparently the true southward extension of the Allegheny Front; and there is a possibility that they reached still farther southeastward although definite proof seems lacking.

It is logical to believe that the forces causing thrust and uplift were able to break the rocks of eastern Randolph partly on account of proximity and partly because the protective mantle of the Pennsylvanian did not extend greatly to the southeastward and hence the thrusts, from time to time, were able to reach the county in comparatively vigorous form. Farther west, on the contrary, increasing distance and increasing resistance of the Pennsylvanian mantle were able to reduce the effect to such an extent that large uplifts did not occur west of Tygart Valley. Furthermore it is easy to believe that after the Pennsylvanian was once broken and partly or wholly eroded from the Tygart Valley and Middle Mountain country buckling of the incompetent Upper Devonian strata became comparatively easy and hence the folding could proceed with renewed vigor until the present structure was achieved.

ANTICLINES AND SYNCLINES.

Several anticlines, or arches, and attendant synclines, or basins, have been produced in Randolph County by the wrinkling of the crust of the earth when the mountains were formed by lateral pressure and uplift. These structural features are approximately parallel to the main mountain ranges of the Appalachian System and most of them are not confined to the limits of the county. Their description, starting at the northwestern corner of the county and continuing in regular order southeastward toward the Pendleton County line, follows:

Hiram Anticline.

The Hiram Anticline of Hennen[1] originates in Preston County, near Independence, crosses the southeastern corner of Taylor, enters Barbour one-half mile east of Hiram, passes southward across Barbour, its axis being 2.3 miles east of Philippi, crosses Tygart River one-fourth mile west of Clements, and enters Randolph County two miles east of Lantz. In Randolph, as now plotted on the Sewell Coal, it extends 3½ miles southeastward, passing just southwest of Kingsville Station and Kingsville Post-Office. About one mile

[1]Ray V. Hennen, Monongalia-Marion-Taylor Rept., W. Va. Geol. Survey, p. 84; 1913.

northeast of King Summit School it turns southwestward and so continues for 19 miles, passing 0.2 mile west of Pumpkintown, crossing Middle Fork River two miles northwest of Cassity, passing 0.3 mile west of Loda and almost directly through See Camp Gap, passing 1.3 miles west of Blue Rock and crossing Left Fork of Buckhannon River at the mouth of Beech Run, and thence continuing in the same direction to a point one mile southwest of Hartridge. Here it turns southeastward for 3½ miles and ends about one mile east of the Parting Springs, dying out against the general monocline which extends westward along Point Mountain from this region.

The surface geology along its axis is mostly that of the Allegheny and Pottsville Series but on Middle Fork River and Left Fork of Buckhannon River the Mauch Chunk Series is brought to the surface and south of Cassity the Allegheny is mostly eroded from the hilltops. At the Barbour-Randolph line the horizon of the Sewell Coal belongs at 1550 feet and at the Parting Springs it is 3200 feet, the southward rise in the structure being quite uniform and at the approximate rate of 63 feet per mile. This rise is due in part to structural uplift and in part to thickening of the Pottsville, Mauch Chunk, and Greenbrier Series. In general the arch is quite symmetrical about its axis, the dips being much the same on either side but on the west there is a much more extensive monocline than is the case on the east.

Belington Syncline.

The Belington Syncline of Reger[2], which is the first basin of Randolph County east of the Hiram Anticline, orginates in southern Preston County about one mile northeast of Marquess, extends southeastward and enters Barbour 0.8 mile northwest of Colebank, passes generally southward near Nestorville and Meadowville, crosses Tygart River in the northwestern edge of Belington, crosses it again one mile southwest of Junior, and enters Randolph County 1.2 miles west of Weaver. In Randolph its course for the next five miles is slightly west of south, its axis crossing Tygart River again just west of Harding and passing through Coalton. At Coalton it turns more to the southwestward and so continues for 16½ miles, passing through Fisher, passing 1.3 miles southeast of Cassity, crossing Stonecoal Run 0.2 mile above and east of its mouth and thereafter for several miles closely following Middle Fork River, passing through Adolph and cross-

[2]David B. Reger, Barbour and Upshur Counties and Western Portion of Randolph County Report, W. Va. Geol. Survey, pp. 76-77; 1918.

ing to the eastern side of Middle Fork one-half mile southeast of Big Laurel Thicket. Three miles south of Big Laurel Thicket it turns southwestward and so continues for 3½ miles, ending near Phillips Camp Run 1.5 miles southeast of Hartridge.

The surface geology along its axis in Randolph County is Allegheny and Pottsville, the former being predominant in the higher tops at the northern end and so continuing to the head of Roaring Creek after which it is almost entirely supplanted by the underlying Pottsville. At the Barbour-Randolph County line the elevation of the Sewell Coal horizon is 1350 feet and at the southern end of the arch it is 2750 feet, making a total rise of 1400 feet in 25 miles or at the rate of 56 feet per mile. The two sides of the basin are decidedly lacking in symmetry, the rise on the west toward the Hiram Anticline being much less abrupt than is the case eastward toward Rich Mountain and Tygart Valley.

Deer Park Anticline.

The Deer Park Anticline of Martin[3] extends from Maryland southwestward into West Virginia, passing across the extreme southeastern corner of Preston County and entirely across Tucker County through Leadmine and Holly Meadows and thence passing two miles northwest of Parsons and, after turning to a more nearly east and west course, reaches the Tucker-Randolph County line midway between the heads of Haddix Run and Valley Fork of Clover Run 2.3 miles northeast of Montrose. In Randolph County it quickly turns southward to a course approximately South 12° West which general direction is maintained with only slight variations to its southern extremity. After crossing to the western side of Leading Creek one mile north of Montrose and passing 0.6 mile west of that village it then crosses Schoolcraft Run and Stonespring Run, crosses Davis Lick Run 1.5 miles west of Kerens, crosses Horse Run and Pearcy Run, passes 0.7 mile west of Gilman, crosses Claylick Run 1.2 miles north of its junction with Leading Creek, crosses Leading Creek 0.5 mile east of its mouth and crosses the bends of Tygart River 1.8 miles west of Elkins. South of Elkins it remains on the eastern side of Tygart River 2.5 miles but crosses to the western side 0.5 mile southwest of Arnold Hill and thence afterward is closely coincident with the river for many miles, passing through Beverly, Dailey, and Steiner and 0.5 mile east of Valley Bend, passing through Mill Creek town and just

[3]G. C. Martin, Accident-Grantsville Folio, No. 160, U. S. Geol. Survey; 1908.

east of Huttonsville, crossing Riffle Creek just east of its mouth, crossing Becky Creek 1.2 miles southeast of Lee Bell, crossing Stewart Run 0.7 mile northeast of Spangler, crossing Conley Run 0.8 mile east of its mouth and Windy Run just east of Valley Head. South of Valley Head it crosses Logan Run 0.3 mile above its mouth, crosses Big Run 1.1 miles southeast of its junction with Tygart River, crosses Tygart River 1.5 miles southeast of Upper Mingo and passes into Pocahontas County 0.4 mile west of Mace.

In Pocahontas it is mapped by Paul H. Price as passing through Mace School, crossing Big Spring Fork of Elk River 0.2 mile west of Linwood, passing across the headwaters of Slaty Fork, crossing Old Field Fork 1.1 miles south of New Pleasant Valley School, and finally dying out at the foot of Red Lick Mountain one mile southwest of Crooked Fork School.

The total length of this anticline in West Virginia is 79 miles, of which five miles are in Preston, 16 miles in Tucker, 47 miles in Randolph, and 11 miles in Pocahontas County. Its surface geology is preeminently that of the Upper Devonian. In Preston and Tucker Counties it is entirely Chemung and the same series outcrops at the Randolph-Tucker line, but the axis is rising southwestward and the Portage comes to the surface about one-fourth mile within the Randolph border and continues as the axial outcrop for about four miles to the valley of Schoolcraft Run. Just south of this run the Genesee is uncovered and forms a narrow belt 5½ miles long and less than one mile wide extending nearly to Claylick Run, almost, if not quite, its entire thickness being exposed at a few points. This area appears to be the highest uplift of the arch in West Virginia. For the next two miles, across Claylick Run, the outcrops are basal Portage but on Leading Creek northwest of Elkins the Genesee is again visible in the creek bluffs and the apparent length of the original outcrop, which is now largely covered with terrace gravel, is about 1.3 miles, extending nearly to Tygart River. Between Elkins and Beverly the river bottom along the anticline is covered with alluvium and there is doubt as to whether any Genesee was ever exposed, but in the vicinity of Beverly the bedded outcrops are Portage and this series continues to form a wide belt for many miles, finally passing under drainage in the valley of Stewart Run just northeast of Spangler.

From Stewart Run southward for seven miles the Chemung Series forms the surface of the declining axis, finally passing below drainage two miles south of Valley Head and south of Logan Run. Beyond that point the decline of the arch is rapid, the Catskill Series being visible for 2.5 miles but passing under the rising topography 1.5 miles southeast of Upper Mingo, and appearing only for a brief interval along the next tributary of Tygart River. From this locality southward up the mountain to the Pocahontas line the outcrops are entirely Mississippian, including the Pocono, Maccrady, Greenbrier, and Mauch Chunk, the surface at the county line being formed by the Bluefield Group of the latter series. In Pocahontas County, as mapped by Price, the outcrops are entirely Mississippian, including the Greenbrier and Mauch Chunk.

Throughout the length of this anticline in Randolph County there is an apparent lack of symmetry, the dips being sharper on the western side and the areal width of outcropping formations narrower than is the case on the east, as shown by the delineation of the series on Map II and by Cross-Sections AA', BB', CC', and DD' on the margin of the same map. In this respect the arch follows the well-known rules of Appalachian structures. On both flanks of the anticline there are numerous minor folds or wrinkles and in some cases there is difficulty in recognizing the main uplift.

North Potomac (Georges Creek) Syncline.

The North Potomac Syncline of Darton and Taff[4], or Georges Creek Syncline of O'Harra[5], is the principal basin of the central portion of Randolph County, its position being generally six or eight miles southeast of and approximately parallel to the Deer Park Anticline. The same syncline has been previously described by various titles in Pennsylvania[6] but these earlier names, although entitled to precedence by the rules of geologic nomenclature, appear to have fallen into such disuse that their revival would now be confusing. In harmony with former West Virginia Reports the name of "North Potomac" is the preferred title, "Georges Creek" being retained in parentheses.

After passing out of Pennsylvania and crossing Maryland the North Potomac (Georges Creek) Syncline enters West Virginia near Hampshire, Mineral County, about 1½

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[4]N. H. Darton and J. A. Taff, Piedmont Folio, No. 28, U. S. Geol. Survey; 1896.

[5]C. C. O'Harra, Allegany County Report, Maryland Geol. Survey, pp. 150-152; 1900.

[6]The name "Buckstown" was applied to it by the First Geological Survey of Pennsylvania, but it was later (Report T2, Second Geol. Survey of Pa.; 1882) termed the "Savage Mountain Synclinal" by John J. Stevenson. Still later (on map made to accompany Report HHH, Sec. Geol. Survey of Pa.; 1888) it was styled the "Wellersburg Basin" by John Fulton.

miles southwest of Piedmont, as previously described by Reger[7], but remains in the State for only about four miles, passing across the North Branch of Potomac River into Garrett County, Maryland, and so continuing for about 25 miles to the vicinity of Fairfax Knob south of Kempton, Maryland, where it cuts across the extreme western tip of Grant County, West Virginia, for one-half mile. It then passes into Tucker County and as described by Reger[8] extends southwestward by way of Thomas and Douglas, crossing the western end of Canaan Mountain, crossing Dry Fork of Cheat just south of and above the mouth of Otter Creek, crossing the northern end of Green Mountain and the Tucker-Randolph County line just west of the point where this line crosses Otter Creek.

In Randolph County, as indicated on Map II, this basin extends generally southwestward, remaining on the western side of Otter Creek for 5½ miles but finally passing through the low gap at the head of Taylor Run and thence passing down this stream 2½ miles and crossing Shavers Fork just above the mouth of Taylor Run and 0.8 mile southeast of and above Bowden. From this locality its course is generally parallel and slightly west of Shavers Fork except that it occasionally cuts across certain meanders of the river which extend westward. South of Bowden its position is 0.4 mile west of Woodrow, 0.5 mile west of Flint, 0.9 mile west of Bemis, and 0.6 mile west of Cheat Junction. In the wilderness south of Cheat Junction it passes just west of the mouth of Red Roaring Run, just east of the mouth of Suter Run, 0.7 mile west of Linan Mine and the same distance west of the mouths of Whitmeadow and Stonecoal Runs, 1.4 miles west of Cheat Bridge, 0.3 mile west of the mouth of Lambert Run, 0.5 mile west of Hopkins and approximately through Hopkins Mine, and passes into Pocahontas County 2½ miles south of Hopkins Mine and 0.3 mile west of Shavers Fork.

In Pocahontas County, its course, as originally mapped by Reger[9] and as later described by Price[10], is a continuation of that in Randolph, its position being 1.2 miles west of Spruce, about one mile west of Thorny Flat, and its southern

[7]David B. Reger, Mineral and Grant Rept., W. Va. Geol. Survey, pp. 90-92; 1924.

[8]David B. Reger, Tucker County Rept., W. Va. Geol. Survey, pp. 94-97; 1923.

[9]David B. Reger, Bull. No. 3, The Cheat Mountain Coal Field of Randolph County, West Virginia, W. Va. Geol. Survey; 1928.

[10]Paul H. Price, Pocahontas County Rept., W. Va. Geol. Survey, pp. 78-79; 1929.

end being in the vicinity of the head of Cloverlick Creek west of Cloverlick Mountain.

From the point where this basin enters West Virginia near Piedmont to the Tucker County line the distance is approximately 30 miles, in Tucker County it is 16 miles, in Randolph 39 miles, and in Pocahontas 13 miles, making a total of 98 miles along the axis from Piedmont to its southern termination. The surface geology along the axis in Randolph County is entirely that of the Pennsylvanian and Mississippian Systems. On Otter Creek at the Tucker-Randolph line the top of the Mauch Chunk Series is just above drainage but soon goes under and thereafter the Pottsville Series covers the axis to the head of Taylor Run along which the Mauch Chunk and a portion of the Greenbrier are exposed. From Taylor Run southward to Bemis there is a brief outcrop of Greenbrier followed by Mauch Chunk with a covering of Pottsville on the spurs of Cheat Mountain which jut outward toward Shavers Fork. From Bemis southward there is an outcrop of Mauch Chunk along the river for several miles nearly to Stalnaker Run but on the actual axis the surface is formed by Pottsville and this series continues to cover it to Lambert Run southwest of Cheat Bridge. From Lambert Run southward to the Pocahontas line there is Pottsville in the spurs of Cheat Mountain but the tributaries of Shavers Fork have cut into the Mauch Chunk.

At the Tucker-Randolph line the elevation of the Sewell Coal along the basin is slightly less than 2700 feet and it gradually increases southward, being 3100 feet at the head of Otter Creek, 3200 feet at the mouth of Taylor Run, and then forming a comparatively high saddle at the same figure for the next two or three miles. At Lower Pond Lick it starts to decline and so continues to Fishinghawk Creek opposite Bemis where it is only 2850 feet. From Fishinghawk Creek southward it continually rises, being 3350 feet at Crouch Run, 3800 feet at Lambert Run, 4150 feet at Hopkins Mine, and 4250 feet at the Randolph-Pocahontas line. In Pocahontas it continues to rise, its theoretical position at Gay Knob, according to Price, being 4900 feet, or 355 feet above the top of the knob. The contours reveal fairly symmetrical slopes on both sides of the axis but they become increasingly steep toward McGowan and Cheat Mountains on the west and toward Shavers and Back Allegheny on the east so that the basin is comparatively narrow, being seldom more than five miles wide between the two escarpments.

PLATE XI.—Characteristic topography of Pottsville Series, looking north from Cassity on Middle Fork River.

PLATE XII.—Looking north down Lost Run from point in county road 1.7 miles west of Cassity, showing topography of Pottsville Series.

PLATE XIII.—View from Point Mountain road near Woodzell, Webster County, looking southeast into valley of Elk River and showing Schooley Peneplain preserved by Pottsville sediments in Gauley and other mountains. Low shelf in foreground is another plain. (Photo. by E. E. Harris.)

PLATE XIV.—View from Point Mountain road one mile southwest of Dodrill School, Webster County, looking northwest across gradually descending Schooley Peneplain. Topography of Pottsville Series. (Photo by E. E. Harris.)

Blackwater Anticline.

The Blackwater Anticline of Darton and Taff[11] which lies next east of the North Potomac (Georges Creek) Syncline in Randolph County, begins in Garrett County, Maryland, two miles southwest of Shallmar, and thence extends southwestward as previously described by the writer in the Mineral-Grant and Tucker County Reports, passing definitely into Grant County, West Virginia, slightly east of Steyer, about six miles from its origin, and thence extending for seven miles in Grant and entering Tucker County at the northern end of the Canaan Valley. In Tucker it extends through Canaan Valley and into the valley of Dry Fork, entering Randolph County just below and north of the mouth of Red Creek, or about one mile north of Dry Fork village.

In Randolph County it passes southwestward, crossing the northern end of Rich Mountain, crossing Laurel Fork of Dry Fork 3½ miles southwest of Jenningston, crossing Middle Mountain two miles farther on, passing 0.4 mile west of the present location of Wymer Post-Office which is now at the summit of Middle Mountain, and thereafter gradually increasing its distance west of the mountain until it becomes approximately 1.5 miles where the arch crosses East Fork of Glady Fork at the mouth of Louk Run, ten miles south of Wymer. From Louk Run it continues 4½ miles to the Randolph-Pocahontas line which it crosses one mile west of Middle Mountain and near the head of Glady Fork. In Pocahontas it has been mapped by Price as continuing 14 miles to the foot of Sandy Ridge south of East Fork of Greenbrier River and one mile southeast of Durbin.

From its beginning to the Grant-Tucker County line the length of this arch is 13 miles, in Tucker it is 19 miles, in Randolph it is 23 miles, and in Pocahontas 14 miles, making a total length of 69 miles. Its surface geology at the northern end is entirely Pennsylvanian but in the Canaan Valley of Tucker County the rocks rise to a huge dome, exposing the Mauch Chunk, Greenbrier, and Pocono Series of the Mississippian. At the southwestern end of this valley the structure declines to a low saddle along Dry Fork southeast of Jenningston, the top of the Greenbrier Series, as shown by Map II, being 3000 feet, although the Catskill Series of the Devonian is exposed in the deep valley of the river. Southwest of Dry Fork there are exposures of Pocono and Greenbrier along the axis at the northern end of Rich Mountain but the arch continues to rise and on Laurel Fork the entire Catskill and

[11]N. H. Darton and J. A. Taff, Piedmont Folio, No. 28, U. S. Geol. Survey; 1896.

part of the Chemung are above drainage. From this region southwestward to the Pocahontas line the axial outcrops are entirely Chemung, flanked by Catskill on either side. In Pocahontas the Chemung continues to cover the arch to its southern end. Its structural characteristics are further exhibited by Cross-Sections AA′ and BB′ as engraved on the margin of Map II.

Job Syncline.

The Job Syncline of Price[12], so named at the suggestion of the writer on account of its maximum development near the village of that name in Randolph County, originates in the valley of Red Creek 1½ miles southwest of Laneville, extends westward three miles to Dry Fork of Cheat, then turns southwestward and quite closely follows Dry Fork, passing through Harman and Hazelwood and just west of Job, and approximately through the mouth of Gandy Creek, and thence continuing with Dry Fork to its head. Beyond the head of Dry Fork it crosses the head of Five Lick Run of Laurel Fork one-half mile northwest of Osceola Post-Office, passes through Cunningham Knob, passes into Pocahontas County just northwest of Blister Swamp, continues in Pocahontas for one mile and then through a southern projection of Randolph for one-half mile, and finally enters Pocahontas again. In the latter county it is mapped by Price as extending southwestward for nine miles and terminating in Frank Mountain 1½ miles south of Thornwood.

The length of this syncline from its origin to the southern end of Randolph County is 26 miles, making its total length 35 miles. Its surface geology in Randolph County is principally that of the Mississippian. At the northern end the outcrops are Pocono and Greenbrier, flanked by Mauch Chunk and Pottsville in the high mountains which tower above Red Creek, but the creek soon cuts into the Catskill Series of the Devonian which is visible along the basin as far south as the mouth of Spruce Run. From this point southward for two miles the Pocono is the lowest exposure but it goes under drainage one mile south of Harman and thereafter for many miles the Greenbrier forms the surface. Near the head of Dry Fork the Greenbrier goes under and the basin is covered by Mauch Chunk but on Five Lick Run the Greenbrier is again visible and this series is the outcrop at the final passing into Pocahontas County although some of the intermediate tops are covered by Mauch Chunk. In

[12]Paul H. Price, Pocahontas County Rept., W. Va. Geol. Survey, p. 81; 1929.

Pocahontas the Mississippian beds soon pass into the air, exposing the Catskill and Chemung of the Devonian.

At the northern end of the basin the elevation of the top of the Greenbrier Series, as exhibited by the structure contours on Map II, is slightly less than 2900 feet but the axis declines and in the vicinity of Hazelwood it is less than 2600 feet. South of Hazelwood there is a continued rise, the top of the Greenbrier at the mouth of Gandy being about 2750 feet, at the head of Dry Fork 3600 feet, at the Blister Swamp 3900 feet, and at the southern end of the county 4100 feet. In general the basin is quite symmetrical the slopes on either side being much the same.

Horton Anticline.

The Horton Anticline of Tilton[13], so named at the suggestion of the writer because of its development near Horton, Randolph County, originates near the head of Big Run of Red Creek, Randolph County, about three miles southwest of Laneville. From this point it extends southeastward two miles and enters Pendleton County, then turns southward, crossing the head of Long Run of Roaring Creek, crossing Horsecamp Run of Seneca Creek and the Elkins-Franklin road at the mouth of McIntosh Run 2.7 miles west of Onego, crossing Seneca Creek just above Strader Run and again crossing it one-third mile below the Falls of Seneca, and reentering Randolph County two miles southeast of Horton. From this point it continues southwestward 11 miles, to the southeastern corner of Randolph, being generally slightly west of the summit of Allegheny Mountain and just west of the Randolph-Pendleton line. Beyond the Randolph line it extends five miles, partly through Pendleton and partly through Pocahontas County, to the common corner of these counties with Highland County, Virginia, and thereafter is plotted by Price as extending five miles farther to the southwest, being at first partly in Pocahontas and partly in Highland County but finally ending in Pocahontas at Buffalo Fork of Greenbrier River three miles southeast of Thornwood. Its total length, as described in the various counties, is 34 miles.

The surface geology at the northern end of this anticline is the Mauch Chunk Series but there is a brief covering of Pottsville in the Roaring Plains, followed again by Mississippian and Devonian rocks in Pendleton County. On the Allegheny Mountain southeast of Horton there is a brief covering of Pocono, followed then by Catskill for the next

[13]John L. Tilton, W. F. Prouty, and Paul H. Price, Pendleton County Rept., W. Va. Geol. Survey, p. 240; 1927.

three miles beyond which the Chemung makes the surface to the southern end of the county. As indicated partly by contours and partly by Cross-Section BB' on Map II, it is a large uplift, apparently somewhat steeper on the east than on the west.

Stony River Syncline.

The Stony River Syncline of Darton and Taff[14], which extends for a few miles across the northeastern corner of Randolph County, originates along the North Branch of Potomac River one mile northeast of Shaw, Mineral County, where it branches southward from the North Potomac (Georges Creek) Syncline. As previously described by the writer in the Mineral-Grant and Tucker County Reports it extends southwestward nine miles through Mineral County, passing into Grant one mile southwest of Wabash; continues in the same general direction for 19 miles through Grant County and enters Tucker four miles south of the Stony River dam; passes nine miles through Tucker County and enters Randolph 2½ miles east of Laneville. In Randolph County its length is only 3.2 miles, its direction being slightly west of south. It crosses South Fork of Red Creek two miles southeast of Laneville, crosses the Flatrock Plains, crosses South Fork again near the head of the stream, and crosses the Roaring Plains into Pendleton County 3½ miles southeast of Laneville. In Pendleton, as mapped by Tilton, it passes down the valley of Roaring Creek, crosses Seneca Creek at Onego, passes southwestward approximately with the crest of Spruce Mountain and goes into Highland County, Virginia, two miles east of its common corner with Pendleton and Pocahontas. Beyond this point, as mapped by Price, it is partly in Highland and Bath Counties, Virginia, but generally in Pocahontas County, West Virginia, and finally enters Greenbrier County four miles west of its common corner with Pocahontas and Bath. In Greenbrier it has not been mapped. Its total length, in all counties where it has been mapped to date, is 109 miles.

In Randolph County, as indicated on Map II, the high tops along the axis of this syncline are covered by Pennsylvanian rocks, including the Conemaugh, Allegheny, and Pottsville Series, but along South Fork of Red Creek the Bluestone, Princeton, and Hinton Groups of the Mauch Chunk are uncovered.

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[14] N. H. Darton and J. A. Taff, Piedmont Folio, No. 28, U. S. Geol. Survey; 1896.

STRUCTURE CONTOURS ON SEWELL (SHARON) COAL.

In that portion of the county lying west of Rich Mountain, which in turn is west of Tygart Valley, and in the Point Mountain, Elk, and Gauley country to the southward, and also in the North Potomac (Georges Creek) Syncline which passes through Otter Creek and Shavers Fork, the base of the Sewell (Sharon) Coal has been used as the basis of the structural contours as exhibited in green color on Map II. In the region named the rocks are still approximately horizontal, being slightly tilted at the edges of the basins but not sufficiently distorted to make contouring difficult. The Sewell (Sharon) Coal outcrops extensively in most of this territory and elsewhere it has, in some cases, been prospected by core drilling and in still other localities, where it is deeply buried or perhaps absent entirely, the approximate position of its horizon can be plotted from the higher coals.

In working out this structure map many observations were taken on the key rock itself and on other known stratigraphic horizons. Elevations were mainly obtained by the use of the aneroid, checked on the nearest government spirit-level determinations as recorded on the topographic maps, and in some cases it was possible to make hand-level measurements directly from bench-marks or posted elevations.

It has been repeatedly demonstrated that elevations obtained by the aneroid under the conditions named above are seldom more than 25 feet too high or too low and usually not more than five or ten feet from the truth and if there were no other sources of error these figures might be taken as the probable limit of inaccuracy. By far the greater uncertainty, however, will be found in those localities where the Sewell (Sharon) Coal is either below drainage or else above the topography and its position must be fixed by using an interval from some other coal or geologic stratum. The Pottsville Series, in which there are many other coals which can be used as auxiliary key rocks, thickens rapidly from north to south in Randolph County, necessitating the use of increasing intervals in this direction. There are also local disconformities, some of which may not always be determined, and hence the increasing thicknesses of the rocks are not always regular or constant. As far as possible these irregularities were investigated by making numerous detailed vertical cross-sections of the strata at favorable points and numerous special measurements from place to place.

The principal structural results of these many observations are condensed in the following table, showing intervals above and below the base of the Sewell (Sharon) Coal at various localities in the county, the figures having been used in determining contours on this plane where direct measurements were impossible. Their use in conjunction with the measured sections published in Chapter V is recommended for those who make further studies of these rocks. Several columns in the table show vacant spaces either because the members named at the left belong above the tops of the ridges or because they lie below drainage and there are no present data to show the information called for. Figures in parentheses indicate that the member was not found in the locality called for at the top of the column, or its horizon was above the topography or below drainage, sufficient general information being available to approximate its interval fairly well by deduction. In order to find the approximate elevation of any stratum its interval from the base of the Sewell (Sharon) Coal should first be obtained by using the table or by referring to the local section measured at the nearest point. Having the structure contours as a guide the stratum should then be easily found:

Intervals above and below Sewell (Sharon) Coal—Randolph County.

MEMBER	Adolph	Bemis	Bowden (Bickle Knob)	Cassity	Cheat Bridge	Hartridge	Hopkins	Job	Laneville	Midvale	Norton	Otter Creek	Pickens	Whitaker Falls
Bakerstown (Thomas) Coal	......	......	......	......	......	......	......	......	650	......	......	......	......	......
Upper Freeport (Davis) Coal	......	......	......	......	......	......	......	......	470	......	......	......	......	......
Upper Kittanning Coal	......	......	......	......	......	......	......	......	380	......	(600)	(760)	......	......
Middle Kittanning Coal	......	......	......	......	......	......	......	......	......	......	560	......	......	......
Lower Kittanning Coal	(885)	(900)	......	(760)	......	(900)	......	......	......	......	520	(725)	(945)	......
Clarion Coal	......	......	......	......	......	......	......	......	......	......	500	......	......	......
Homewood Sandstone (top)	......	875	......	750	......	......	......	......	365	(650)	480	700	(935)	......
Upper Mercer Coal	......	825	......	(700)	......	......	......	......	280	(590)	390	625	(885)	......
Lower Mercer (Stockton) Coal	......	800	......	(660)	......	......	......	......	235	......	375	600	(835)	......
Quakertown Coal	665	700	(600)	550	(700)	(750)	......	......	155	(440)	300	500	(780)	......
Chilton Coal	......	560	......	......	560	......	......	......	......	......	......	......	(645)	......
Cedar Grove Coal	......	530	......	......	540	......	......	......	......	......	......	400	(605)	......
Alma Coal	505	490	......	450	510	......	......	......	......	......	......	......	(545)	......
Campbell Creek (Peerless) Coal	475	450	......	405	475	500	......	......	......	310	210	325	(515)	......
Powellton Coal	425	400	......	365	425	400	......	......	......	300	165	......	415	......
Eagle Coal	395	375	325	305	375	320	375	......	......	270	130	275	(345)	(700)
Gilbert Coal	265	275	250	205	225	255	250	......	......	200	90	200	(275)	(550)
Douglas Coal	......	230	230	......	......	......	225	......	......	......	......	......	......	(525)
Lower Douglas Coal	......	225	225	......	......	......	210	......	......	......	......	......	......	(500)
Upper Nuttall Sandstone (top)	260	220	220	(200)	200	(235)	200	(275)	145	180	(85)	175	(250)	490
Hughes Ferry Coal	210	150	150	160	160	185	125	(175)	(70)	140	70	100	(200)	240
Lower Iaeger Coal	180	125	125	130	125	150	100	......	......	......	......	......	(160)	(200)
Castle Coal	120	75	75	125	100	100	75	90	(55)	......	50	50	(110)	160
Sewell "B" Coal	55	40	40	60	50	40	40	50	......	15	......	......	(40)	(70)
SEWELL COAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Welch Coal	......	30	(30)	100	40	......	40	90	40	......	10	(25)	(50)	65
Little Raleigh Coal	......	60	(60)	......	(70)	......	......	......	......	......	100	......	......	......
Beckley Coal	......	80	......	......	......	......	......	......	......	......	......	......	......	......
Fire Creek Coal	......	100	(80)	......	100	......	115	130	110	......	......	110	(125)	185
Little Fire Creek Coal	......	110	......	......	......	......	......	......	......	......	......	......	......	......
Mauch Chunk Series (top)	(150)	110	100	165	100	35	115	140	130	20	(140)	120	(165)	185
Princeton Sandstone (base)	......	140	200	......	200	......	200	510	370	85	......	200	(265)	325
Stony Gap Sandstone (base)	......	500	450	......	(700)	......	740	820	(575)	......	......	400	(500)	750
Droop Sandstone (base)	......	(800)	735	......	(1000)	......	1000	1140	(875)	......	......	600	(715)	1100
Greenbrier Series (top)	......	(1000)	975	......	(1200)	......	(1250)	1320	1025	......	540	850	(850)	1330
Maccrady Series (top)	......	......	......	......	(1400)	......	(1650)	......	......	......	......	......	......	(1630)
Pocono Series (top)	......	......	1225	......	(1425)	......	(1675)	(1570)	1390	......	720	(1100)	(950)	(1730)
Catskill Series (top)	......	(1250)	1325	......	(1550)	......	(1725)	(1700)	(1520)	......	790	(1200)	(1100)	(1880)

STRUCTURE CONTOURS ON TOP OF GREENBRIER SERIES.

In the synclinal region of the eastern portion of the county, from Laneville southward through the Dry Fork Valley toward Osceola, the Sewell Coal could be used successfully for contouring only in a rather limited area between Laneville and Job. South of Job its horizon is almost entirely above the topography and hence its use for contouring would be not only speculative and inaccurate but also confusing for those who may desire to trace local formations. On the other hand the top of the Greenbrier Series, generally formed by the Alderson Limestone member, is nearly always above drainage and possible of definite recognition in this territory, the principal exception being the region just southeast of Laneville where it is buried but where its position can be rather closely computed.

Under the conditions named the **Top of the Greenbrier Series** has been selected as the structural key rock for this eastern region and the contours which represent it are engraved in **red color** on Map II.

In the preparation of this portion of the structure map the same general methods as used in the western part of the county were employed. In general the Mauch Chunk and Greenbrier Series thicken from north to south, the Pocono is quite irregular, and the Catskill thickens from west to east. The following table was used when necessary in plotting the Greenbrier structure map and it will be found convenient for those who desire to pursue further stratigraphic studies:

Intervals above and below Top of Greenbrier Series—Randolph County.

MEMBER	Beverly	Bemis	Bowden (Bickle Knob)	Cheat Bridge	Elkins (Aggregates)	Evenwood	Hopkins	Huttonsville	Job	Laneville	Mingo	Montrose	Osceola	Otter Creek	Valley Head	Whitaker Falls	Whitmer
Bakerstown (Thomas) Coal	......	......	......	......	......	......	......	......	......	1675	......	......	......	......	......	......	......
Upper Freeport (Davis) Coal	......	......	......	......	......	......	......	......	......	1495	......	......	......	......	......	......	......
Homewood Sandstone (top)	......	1875	......	......	......	......	......	......	......	1390	......	......	......	1550	......	......	......
Upper Nuttall Sandstone (top)	(800)	(1220)	1150	(1400)	(700)	......	(1475)	(1100)	(1595)	(1170)	(1350)	......	......	1025	1110	1820	......
Hughes Ferry Coal	(750)	(1150)	1100	(1360)	(650)	......	(1425)	(1050)	(1495)	(1095)	(1275)	......	......	950	950	1570	......
Castle Coal	(600)	(1075)	1040	(1300)	(600)	......	(1350)	(950)	1410	(1080)	(1225)	......	......	900	900	1490	......
Sewell Coal	500	(1000)	975	(1200)	525	(875)	(1250)	(850)	1320	1025	(1125)	(525)	......	850	845	1330	......
Welch Coal	......	(970)	......	(1160)	480	(850)	(1210)	(800)	1230	985	(1080)	(480)	......	(825)	805	1265	......
Beckley Coal	......	(920)	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Fire Creek Coal	......	(900)	......	(1100)	......	(760)	(1135)	......	1190	915	(1010)	......	......	740	755	1145	......
Mauch Chunk Series (top)	400	(890)	875	(1100)	400	(750)	(1135)	(700)	1180	895	1005	(400)	(1200)	730	755	1145	(1180)
Princeton Sandstone (base)	(325)	(860)	775	(1000)	350	(600)	(1050)	(600)	810	655	755	(350)	(850)	650	735	1005	880
Stony Gap Sandstone (base)	250	(500)	525	(500)	185	(425)	(510)	(450)	500	(450)	435	(185)	500	450	445	580	300
Droop Sandstone (base)	120	(200)	240	(200)	100	120	(250)	(175)	180	(150)	175	(100)	205	150	160	200	180
Ada Shale (base)	90	(150)	(200)	(120)	(60)	80	(200)	(110)	110	(100)	120	(60)	(125)	(110)	125	(125)	(145)
Reynolds Limestone (base)	75	(125)	(175)	(95)	(50)	75	(175)	(100)	100	(90)	90	(50)	(100)	(100)	100	100	(140)
Webster Springs Sandstone (base)	(50)	(100)	105	75	(40)	(60)	(125)	(60)	75	(65)	(65)	(40)	(50)	(75)	10	10	125
Glenray Limestone (base)	......	(50)	65	(50)	30	......	(75)	(50)	25	40	55	......	30	......	......	......	40
GREENBRIER SERIES (top)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alderson Limestone (base)	......	(50)	50	(50)	40	60	(75)	(40)	75	100	35	......	25	(75)	40	(50)	85
Cypress Sandstone (base)	......	(60)	60	(60)	......	......	(85)	(50)	85	145	40	......	......	(85)	......	......	......
Union Limestone (Gasper) (base)	60	(125)	125	(120)	70	75	(165)	(100)	160	225	65	40	150	(160)	105	(100)	170
Union Limestone (Bethel) (base)	70	(145)	145	(125)	95	125	(185)	(120)	175	250	(70)	(50)	215	(175)	125	(125)	185
Union Limestone (Fredonia) (base)	115	(250)	240	(175)	180	200	(250)	(200)	250	350	100	100	315	(250)	165	(165)	300
Pickaway Limestone (base)	......	......	......	......	......	215	(300)	......	......	......	170	......	......	......	185	(185)	......
Taggard Limestone (base)	......	......	......	......	......	......	......	......	......	......	180	......	......	......	190	(190)	......
Patton Limestone (base)	......	......	......	(200)	......	235	(350)	......	......	......	260	......	......	......	260	(250)	......
Sinks Grove Limestone (base)	......	......	......	......	......	......	(400)	......	......	......	330	......	......	......	295	(300)	......
Maccrady Series (base)	......	......	......	(225)	......	......	(425)	......	......	......	345	......	330	......	......	(400)	......
Broad Ford Sandstone (base)	......	......	335	(350)	230	290	(525)	(275)	325	475	500	(250)	(415)	(350)	335	(550)	375
Sunbury Shale (base)	......	......	......	......	250	......	......	......	360	500	535	(275)	......	......	350	......	415
Berea Sandstone (base)	......	......	......	......	......	......	......	......	380	550	560	(300)	......	......	......	......	420
Saxton Shale (base)	240	(350)	(400)	(450)	300	380	(625)	(375)	(450)	(700)	(645)	(375)	......	......	440	(650)	(550)
Catskill Series (base)	590	(1000)	(1125)	(1050)	(1025)	1320	(1325)	(975)	(1500)	(1550)	(1175)	1000	......	(1050)	970	......	(1600)
Hendricks Sandstone (base)	680	......	(1200)	......	1050	1370	......	(1025)	......	......	(1225)	1050	......	(1100)	1000	(1400)	......
Valley Head Sandstone (base)	(1100)	......	(1600)	......	(1525)	(1820)	......	(1450)	......	......	(1675)	(1500)	......	(1500)	1500	......	......
Elkins Sandstone (base)	2250	......	(2600)	......	2750	(2350)	......	(2700)	......	......	(2850)	(2750)	......	(2750)	(2750)	......	......
Chemung Series (base)	3400	......	(4000)	......	4250	(3500)	......	(3900)	......	......	(4000)	4000	......	(3950)	(4000)	......	......
Portage Series (base)	(5500)	......	......	......	(6250)	(5500)	......	(5900)	......	......	......	6300	......	......	......	......	......
Genesee Series (base)	(5700)	......	......	......	(6450)	......	......	(6100)	......	......	......	6500	......	......	......	......	......

CROSS-SECTIONS.

In certain portions of Randolph County, including Tygart Valley and, farther east, the Middle Mountain country embracing most of the drainage of Glady Fork and Laurel Fork, the rocks have been too much distorted to be used as the basis of a structure map, being frequently crushed and in some cases perhaps slightly overturned or otherwise so disturbed that they could not be accurately contoured. In this region delineation of the structure by means of graphic cross-sections was considered the best practicable method. Four cross-sections have accordingly been prepared, with the help of Mr. George W. Grow as draftsman, using a vertical and linear scale of 1-62,500, or 5,208 feet to the inch, which is the linear scale of the topographic maps. All of these cross-sections extend approximately at right angles to the line of strike, some slight deviations being made from this rule to include certain interesting features. All of them extend entirely across the width of the county and therefore include not only the belts of highly tilted strata but also the areas of low structural relief as well.

Cross-Section AA′.—Cross-Section AA′, approximately 22 miles long, starts at a high point on Laurel Ridge three miles southwest of Montrose and extends southeastward across Leading Creek, Shavers Fork, McGowan Mountain, Otter Creek, Shavers Mountain, Glady Fork, Middle Mountain, Laurel Fork, Rich Mountain, and Dry Fork, and ends on Brierpatch Mountain 1.7 miles east of Hazelwood, as shown on Map II.

Cross-Section BB′.—Cross-Section BB′, approximately 25 miles long, starts at the point where the Randolph-Barbour County line turns westward from the crest of Laurel Ridge 4½ miles northwest of Elkins and extends southeastward across Leading Creek slightly northwest of Elkins, and across Cheat Mountain, Shavers Fork, (at Woodrow), Shavers Mountain, Glady Fork, Middle Mountain, Laurel Fork, Rich Mountain, Dry Fork, Little Middle Mountain, and Gandy Creek, and ends on Allegheny Mountain 3.7 miles southeast of Horton, as shown on Map II.

Cross-Section CC′.—Cross-Section CC′, approximately 22 miles long, starts at the forks of Middle Fork River south of Gale and extends southeastward across Left Fork of Middle Fork River, Rich Mountain, Tygart River (north of Valley Bend), Cheat Mountain, and Shavers Fork, and ends on Shavers Mountain 1.1 miles southwest of Wildell, as shown on Map II.

Cross-Section DD'.—Cross-Section DD', approximately 23 miles long, starts at the common corner of Upshur, Webster, and Randolph Counties 2.2 miles south of Craddock and extends southeastward through Pickens, across Turkeybone Mountain, through the plateau connecting Rich and Point Mountains, across Tygart River (north of Valley Head), across Cheat Mountain, and ends at the Randolph-Pocahontas County line at Shavers Fork 1.9 miles south of Hopkins, as shown on Map II.

UNCONFORMITIES.

Unconformities of the generally accepted classic type, where the term is limited to a tilted or irregularly eroded surface that has been covered again by horizontal strata so that an angular junction of the beds of different ages is formed, are not common in the rock column of Randolph County. There are numerous instances of disconformities, however, where certain formations are locally or even regionally absent, the remaining beds being in parallel position and indicating that the absent beds probably never were deposited.

In the descending rock column of the county an important break in the succession is found at the contact of the Pottsville Series of the Pennsylvanian with the underlying Mauch Chunk of the Mississippian. Here the coarse and often conglomeratic sandstones of the upper Coal Measures rest upon red and green shales and green, flaggy, and micaceous sandstones, almost totally devoid of coal and lacking most of the typical Upper Carboniferous flora, indicating an entirely different mode of accumulation with probable stages of exposure to air and consequent erosion. Except in the immediate contact zone, however, where irregularities of surface have been caused by differential erosion of the top of the Mauch Chunk, and where the low areas were later filled with Pottsville lenses, there is no generally perceptible disagreement in the dip of the beds, indicating that little folding took place in the lapse of time that intervened between Mauch Chunk and Pottsville deposition.

There is little apparent unconformity at the base of the Mauch Chunk where it rests on the Greenbrier although the stratigraphic sequence in the former is not as full as in more southern counties.

At the base of the Greenbrier its massive limestones in the extreme southern end of the county rest on the red and purple shales of the Maccrady but in this zone some of the basal beds of the Greenbrier are absent and there is a further thinning toward the north. The Maccrady itself also thins out and disappears farther north in the county.

The Pocono, which normally underlies the Maccrady in regions where the fuller column of Mississippian is present, is also a very irregular formation in Randolph County. In certain regions it is 225 feet or more in thickness but it often thins down to 50 feet and at some localities is apparently absent, allowing the Greenbrier to rest on the Catskill Series of the Devonian. Here, also, there is little or no angularity, indicating lack of deposition rather than erosion. Regardless of the parallel condition of the beds, however, the lapse of a very considerable time interval is quite apparent both on account of the change in fauna and flora and because of the known absence of many of the older Mississippian formations of more western States.

At the base of the Catskill, where it rests on the Chemung Series there is not only a change in the lithology but also a difference in marine conditions. The green sandstones and shales of the Chemung carry an abundant marine fauna but in the Catskill, which is usually red, marine fossils are scarcely found at all.

The contact of the Chemung with the underlying Portage is not well marked, there being no apparent angularity. The main difference is the presence of abundant marine fossils in the Chemung and their almost total absence in the Portage. There are also some slight lithologic changes.

The Portage Series rests on the black, fissile and bituminous shales of the Genesee, the latter having a rather constant marine fauna. It is quite possible, however, that the variation of lithology in these two series may have been largely caused by differences of material at the source of the sediments rather than by any decided fluctuation of the sea-level.

ABSENCE OF FAULTS.

Faults, in the classic sense of beds which have been broken and vertically displaced or thrust over each other, were not observed in Randolph County. In the folded Devonian strata of Tygart Valley, however, there is much evidence of local crushing and possibly some slight overturning of the beds. The displacements, if any exist, are so slight that they can scarcely be called faults.

CHAPTER V.

MEASURED SECTIONS.

INTRODUCTION.

The surface rocks of Randolph County embrace the Quaternary, with Recent and Pleistocene deposits, and a portion of the Paleozoic, with Pennsylvanian, Mississippian, and Upper Devonian sediments. A classification of all the beds named, involving approximately 10,000 feet of rocks, is published in Figures 4 and 5, on pages 100-101.

The Quaternary rocks are represented by clays, gravels, and sand beds, present along the river and creek bottoms, and by river-terrace deposits of considerable quantity, some of which are of evident Pleistocene age, although not of glacial origin. These two types of comparatively young material are represented on Map II under the general title of Alluvium. As agricultural soil they form a valuable economic resource of the county. The terrace deposits have been discussed at length on pages 36-42.

The Conemaugh Series of the Pennsylvanian, which is the youngest of the Paleozoic beds of the county, probably once covered the major portion of the Randolph area but is now confined to isolated localities in the northeastern and northwestern corners of the county. Its present thickness, even in the deep Stony River Basin, is only about 400 feet, or scarcely half of its full development in the North Potomac Basin of Tucker, Grant, and Mineral Counties.

The Allegheny Series, having a thickness of 100 to 250 feet, is present only in the western edge of the county next to Upshur and Barbour and in the northeastern corner next to Tucker, Grant, and Pendleton Counties.

The Pottsville Series, represented by the Kanawha and New River Groups and having a thickness which varies from 500 to 1100 feet, covers nearly all the western third of the county and is also extensively preserved in the North Potomac (Georges Creek) Syncline of the central belt and to a less areal extent in the Job and Stony River Synclines of the northeastern corner of the county.

The Mauch Chunk Series of the Mississippian, containing the Bluestone, Princeton, Hinton, and Bluefield Groups, and comprising 400 to 1400 feet of sediments, forms the slopes of many mountains and is exposed to good advantage in many deep valleys. Its development in this county is of an intermediate character, being much greater than in northern West Virginia and much less full than in the southern part of the State.

The Greenbrier Series of the Mississippian, containing 100 to 400 feet of predominantly calcareous beds, outcrops in many long belts on the slopes of certain mountains and may be studied to good advantage, but in many respects it is less interesting than in southern West Virginia.

The Maccrady and Pocono Series of the Mississippian are poorly developed all over the county. The Maccrady exists only as a tongue in the southern end, being seldom as much as 50 feet thick. The Pocono reaches a maximum of about 225 feet at some points but as a rule is much thinner and is often entirely absent by unconformity. It carries an interesting marine fauna, however, and is well worth careful study.

The Catskill Series of the Devonian, with a thickness of 400 to 1200 feet, is a most interesting formation in Randolph County, having a well-developed flora that is of high scientific importance, and also having some rather well-preserved fish remains.

The Chemung Series of the Devonian, with a thickness of 2500 to 3000 feet, presents a most interesting column, teeming with the remains of ancient life, both faunal and floral. The unusual development of trees in this epoch is not known to be elsewhere paralleled to so great a degree in the same series.

The Portage Series of the Devonian, varying from 2000 to 2500 feet in thickness, is much less interesting than the Chemung, as it contains only scanty marine forms but its siliceous casts of ancient flora afford an intriguing problem.

The Genesee Series of the Devonian, with a thickness of 150 to 200 feet, is generally the basal exposure in Randolph County, although it is possible that a slight amount of Hamilton may be uncovered at one or two points. This small but interesting Genesee exhibits its well-known guide fossils and is otherwise worth attention.

At various selected localities in the county vertical cross-sections have been carefully measured. In the regions of horizontal or gently dipping beds the opportunity for such measurements is exceptionally good and the results are therefore essentially accurate. In localities where the beds dip steeply more care has been necessary and traverse by pacing and computation by trigonometric methods has been involved. All of these measured sections appear in the following pages.

Many of these sections contain parenthetic references to Fossil Lot numbers indicative of collections made in the particular zone described. Nearly all plant fossil collections have been referred to Dr. David White, of the United States Geological Survey, who also attended to part of the collection in the field, but final descriptions are not ready and only preliminary identifications of certain collections are available for presentation in this volume. Marine fossils, with few exceptions, have been studied by Dr. John L. Tilton of the Survey Staff, whose identifications and comment appear in Chapter XV. In certain instances, also, the fossil names have been repeated in the measured sections for the sake of convenience. In some instances fossils are recorded in the sections without attached lot numbers. All such lists are identifications made in the field by the writer without submission to Dr. White or Dr. Tilton and in such cases any mistaken identification should not be attributed to them.

MEASURED SECTIONS, ROARING CREEK DISTRICT.

Roaring Creek District comprises a segment of the western part of the county, next to Barbour and Upshur and in the watershed of Tygart and Middle Fork Rivers. Its surface rocks are mainly Pennsylvanian, being only slightly disturbed except in the Rich Mountain region and therefore affording an opportunity to make good measurements along the strike. The measured sections presented for this district in the following pages were partly made by the writer and partly by D. D. Teets, Jr., who assisted in the preparation of the previous report which covered part of Randolph County. Proper acknowledgment to the observer is made in the description of each section.

The four following sections in Roaring Creek District are republished from pages 164-168, inclusive, of the Barbour, Upshur and Western Randolph Report, having been revised as to certain correlations and the numbers of coal prospects and borings being changed to harmonize with those of the present Report:

Findley Section.

Roaring Creek District; starting at top of hill one-half mile south of Findley and extending northward to Tygart River near mouth of Little Laurel Run; measured with aneroid by D. D. Teets, Jr., along descending structure and not corrected for dip which should be about

50 feet along line of traverse; arranged in descending stratigraphic order.

	Thick-ness. Feet.	Total. Feet.	Inter-vals. Feet.
Allegheny Series (175'+)			
1. Sandstone, Lower Freeport, massive	25	25	
2. Concealed	25	50	
3. Bench	5	55	
4. Concealed	59	114	
5. Slate	2	116	
6. Coal 0' 10"; 7. Slate, black 3 2; 8. Coal 1 0; 9. Slate, black 1 8; 10. Coal 2 4 — Lower Kittanning (2085' B.) (Mine No. 3 on Map II)	9	125	125
11. Sandstone, Kittanning, and concealed	25	150	
12. Concealed	25	175	
Pottsville Series—Kanawha Group (280'+)			
13. Concealed	35	210	
14. Sandstone, Homewood, massive	30	240	
15. Slate, with coal streaks, Upper Mercer	13	253	128
16. Sandstone	12	265	
17. Slate, black	13	278	
18. Coal, Lower Mercer (Stockton)	2	280	
19. Sandstone, massive 45'; 20. Concealed 20; 21. Sandstone, massive 30 — Upper Connoquenessing	95	375	122
22. Concealed to bed of Tygart River (1755' B.)	80	455	

Leiter Section.

Roaring Creek District; starting at the top of the hill just southeast of Leiter and extending northwestward to vicinity of Leiter; measured with aneroid by D. D. Teets, Jr., along approximate strike of rocks and arranged in descending stratigraphic order.

	Thick-ness. Feet.	Total. Feet.	Inter-vals. Feet.
Allegheny Series (160'+)			
1. Concealed	40	40	
2. Sandstone, Lower Freeport, massive, pebbly	15	55	
3. Concealed	5	60	
4. Prospect opening, Upper Kittanning (no coal in sight, thickness supplied)	5	65	65
5. Concealed	83	148	
6. Slate	2	150	
7. Coal 1' 6"; 8. Slate, black 0 10; 9. Coal 1 2; 10. Slate, bony 0 8; 11. Coal 0 1; 12. Slate, dark 0 9; 13. Coal 2 8; 14. Shale, gray 0 10; 15. Coal, soft (visible) 1 3 — (9' 9") Clarion (2025' B.) (Davis Coal & Coke Co., Leiter Mine, No. 37 on Map II)	10	160	95

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (115'+)				
16.	Slate and concealed	40	200	
17.	Sandstone, Homewood, and concealed	75	275	

Norton Section.

Roaring Creek District; starting at top of hill west of Norton Station and extending eastward to Tygart River at Norton Station and thence continuing with the record of the Wm. Corley No. 9 (48) Coal Test Boring, as supplied by John T. Davis; surface portion measured with aneroid by David B. Reger and D. D. Teets, Jr., along approximate strike of rocks; section arranged in descending stratigraphic order; published as Roaring Creek Junction Section, pages 166-7 of Barbour, Upshur and Western Randolph Report.

		Thickness. Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
Allegheny Series (87'+)							
1.	Concealed from top of hill	45	0	45	0		
2.	Coal 1' 1"						
3.	Slate, bony 0 5						
4.	Coal, soft, columnar 2 8						
5.	Slate, dark 0 9						
6.	Coal, soft 1 8						
2–6.	Lower Kittanning (2030' B.) (Davis Colliery Co. No. 5 Coaling Station Mine, No. 10 on Map II)	6	7	51	7	51	7
7.	Concealed	35	5	87	0		
Pottsville Series—Kanawha Group (404' 4")							
8.	Sandstone, Homewood, massive	30	0	117	0		
9.	Concealed	60	0	177	0		
10.	Sandstone, Upper Connoquenessing, massive, pebbly	47	0	224	0		
	Continued by Wm. Corley No. 9 (48) Coal Test Record (1858' L.):						
11.	Surface	9	6	233	6		
12.	Fire clay	15	8	249	2		
13.	Sandstone, Lower Connoquenessing, (Lower Winifrede?), gray	22	5	271	7		
14.	Shale, green, and fire clay	21	3	292	10		
15.	Sandstone, Upper Chilton?, gray	12	7	305	5		
16.	Shale, green	41	10	347	3		
17.	Sandstone, Monitor?, gray	6	4	353	7		
18.	Fire clay	6	7	360	2		
19.	Coal, slate and sulphur, Campbell Creek (Peerless Bench)	0	7	360	9	309	2
20.	Fire clay and sandstone, mixed	12	6	373	3		
21.	Sandstone, Brownstown, gray	21	11	395	2		
22.	Slate, sandy	8	8	403	10		
23.	Coal 0' 2"						
24.	Slate and sand 1 0						
25.	Coal 1 6½						
23–25.	Powellton	2	8½	406	6½	45	9½
26.	Slate, sandy	5	10½	412	5		
27.	Sandstone and slate, mixed	5	9	418	2		

		Thickness. Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
28.	Sandstone, Eagle, gray	18	4	436	6		
29.	Slate and fire clay	2	4½	438	10½		
30.	Coal, Eagle	0	3½	439	2	32	7½
31.	Sandstone and sand slate, mixed	9	9	448	11		
32.	Sandstone, Decota, gray	23	5	472	4		
33.	Slate	10	0	482	4		
34.	Coal and slate, mixed, Gilbert	1	1	483	5	44	3
35.	Fire clay and green shale, mixed	7	11	491	4		
Pottsville Series—New River Group (208' 3")							
36.	Slate, streak sandstone	10	10½	502	2½		
37.	Coal, Hughes Ferry	5	3½	507	6	24	1
38.	Fire clay, sand slate, and slate, mixed	10	10½	518	4½		
39.	Coal 0' 1½"						
40.	Slate 0 3½						
41.	Coal, bony 0 1½ — Castle	2	8½	521	1	13	7
42.	Coal 2 2						
43.	Slate and fire clay	25	9	546	10		
44.	Sandstone, Lower Guyandot?, gray	23	3	570	1		
45.	Coal, bony 0' 2½"						
46.	Slate, and little coal 0 5½						
47.	Coal, little slate and sulphur 1 4 — Sewell (Sharon)	2	8½	572	9½	51	8½
48.	Slate and bony coal 0 8½						
49.	Fire clay	7	1½	579	11		
50.	Clay	1	1	581	0		
51.	Coal, Welch, bony	0	10	581	10		
52.	Slate and fire clay	2	4	584	2		
53.	Sandstone, gray	13	2	597	4		
54.	Coal	0	2	597	6		
55.	Sandstone, gray 36' 4"						
56.	Sandstone, gray, and conglomerate 3 2 — Upper Raleigh (Sharon)	73	7	671	1	98	3½
57.	Sandstone, gray 34 1						
58.	Slate, black, and little seams of coal, Little Raleigh	3	5	674	6		
59.	Fire clay and gray sandstone, mixed	3	9	678	3		
60.	Sandstone, gray, and conglomerate	20	4	698	7		
61.	Sandstone and sand slate, mixed, to bottom	1	0	699	7		

Pumpkintown Section.

Roaring Creek District; starting at the top of the hill south of Laurel Creek 1.5 miles west of Pumpkintown and extending northward to Staunton and Parkersburg Pike at the "Half-Way House"; measured with aneroid by David B. Reger along strike of rocks and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Allegheny Series (75'+)			
1. Sandstone, East Lynn, massive, capping ridge	45	45	
2. Concealed	30	75	75
Pottsville Series—Kanawha Group (342'+)			
3. Sandstone, Homewood, massive, partly concealed in bluff	55	130	
4. Coal 0' 6" 5. Slate, dark 0 2 6. Coal 0 8 7. Slate, dark 0 2 8. Coal, soft 1 3 9. Shale, gray 1 0 10. Coal 1 6 (5' 3") Upper Mercer (2380' B.) (Pat Ford Mine, No. 44 on Map II)	5	135	60
11. Concealed in bench	5	140	
12. Sandstone, Upper Connoquenessing, partly concealed in bluff	135	275	
13. Bench, contains coal ½ mile farther east, Quakertown	10	285	150
14. Concealed to run	130	415	
15. Coal, exposed on Rafferty farm ½ mile westward, Campbell Creek (Peerless Bench), thickness supplied	2	417	132

MEASURED SECTIONS, MIDDLE FORK DISTRICT.

Middle Fork District occupies the southwestern corner of the county, next to Upshur and Webster Counties, and embraces portions of the watersheds of Middle Fork, Buckhannon, and Elk Rivers. Its surface rocks, which lie approximately horizontal except along the eastern edge next to the summit of Rich Mountain, include the entire Pottsville and the upper portion of the Mauch Chunk Series.

The twelve following sections have been previously published in the Barbour, Upshur and Western Randolph Report, pages 168-181, inclusive. In the present Report the map numbers of mines and borings have been harmonized with Map II of the present Report and certain revisions and additional correlations have been made:

Lost Run of Middle Fork Section.

Middle Fork District; starting at the top of the mountain 1.5 miles northwest of Cassity and extending northeastward to Middle Fork River one-third mile southeast of the mouth of Lost Run; measured with aneroid by D. D. Teets, Jr., along strike of rocks and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series (795′+)			
1. Concealed	10	10	
2. **Sandstone, Upper Connoquenessing,** massive, pebbly	50	60	60
3. Concealed	150	210	
4. Bench, concealed	5	215	
5. Concealed	170	385	
6. Bench, concealed	5	390	
7. Concealed	35	425	
8. Bench, concealed	5	430	
9. Concealed	95	525	
10. Bench, concealed	5	530	
11. Concealed	105	635	
12. Bench, concealed	5	640	
13. Concealed	27	667	
14. **Coal, Sewell (2115′ B.)**	3	670	610
15. Concealed	20	690	
16. **Sandstone, Upper Raleigh (Sharon)**	35	725	
17. Concealed	70	795	125
Mauch Chunk Series—Bluestone Group (25′+)			
18. Shales, red and variegated, to Middle Fork River	25	820	

Lick Run of Middle Fork Section.

Middle Fork District; starting at top of hill west of Lick Run and extending southwestward to Middle Fork River 0.7 mile northwest of Cassity; measured with aneroid along strike of rocks by D. D. Teets, Jr., and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series (705′+)			
1. Concealed	15	15	
2. **Sandstone, Upper Connoquenessing,** massive, conglomerate	89	104	
3. **Coal blossom, Quakertown**	1	105	105
4. Concealed	225	330	
5. **Sandstone, Grapevine?,** massive	60	390	
6. Concealed	89	479	
7. **Coal blossom, Hughes Ferry**	1	480	375
8. Concealed	172	652	
9. **Coal, Sewell (Sharon),** (2040′ B.)	3	655	175
10. Concealed	15	670	
11. Shale, gray, slaty	10	680	
12. **Sandstone, Welch,** massive, to Middle Fork River	25	705	

Cassity Section.

Middle Fork District; starting at the top of Bear Knob 1.1 miles west of Cassity and extending eastward nearly to Middle Fork River at Cassity and thence continuing with record of the Andrew Currence Coal Test Boring No. 11 (15); surface portion measured with hand-level by David B. Reger with the assistance of R. O. Zirkle, guide, and arranged in descending stratigraphic order but not extending below stratigraphic level of top of boring; total uncorrected error in excess of true vertical measurement on account of eastward dip in surface portion is about 25 feet.

	Thickness. Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
Pottsville Series—Kanawha Group (544')						
1. Sandstone, Homewood, capping Bear Knob, (top, 2807' L.)	40	0	40	0		
2. Concealed	60	0	100	0		
3. Sandstone, Upper Connoquenessing, massive, pebbly at top, cliff rock	100	0	200	0		
4. Shale, Quakertown, black, thickness concealed, (one large Naiadites fossil found)	---	--	200	0	200	0
5. Coal, Quakertown (2606' L.), reported	0	8	200	8		
6. Concealed	144	4	345	7		
7. Coal, Campbell Creek, (Peerless Bench) (2461' L.)	0	7	345	7	145	7
8. Concealed	85	5	431	0		
9. Slate, black	1	0	432	0		
10. Coal, (2375' L.)	0	4	432	4		
11. Concealed	8	8	441	0		
12. Coal 1' 0"; 13. Slate, dark 0 7; 14. Coal 2 2 } Eagle (Frank Phares Prospect, No. 130 on Map II)	3	9	444	9	99	2
15. Concealed in steep bluff	82	3	527	0		
16. Coal (2279' L.), reported	1	0	528	0		
17. Concealed	15	0	543	0		
18. Coal, Gilbert (2263' L.), visible	1	0	544	0	99	3
Pottsville Series—New River Group (371' 10½")						
19. Concealed	47	6	591	6		
20. Coal, Hughes Ferry (2215' L.), reported	0	6	592	0	48	0
21. Concealed	30	0	622	0		
22. Slate, black	3	0	625	0		
23. Coal opening, Castle (Jack Long Mine, No. 201 on Map II), (2180' L.), 1' visible, reported 2' 4" to	2	0	627	0	35	0
24. Sandstone, Guyandot, massive	25	0	652	0		
25. Concealed	35	0	687	0		
26. Shale, Skelt, sandy	3	6	690	6		
27. Coal, Sewell "B" (2116' L.)	0	6	691	0	64	0
28. Sandstone, Lower Guyandot, shaly	5	0	696	0		
29. Concealed	43	0	739	0		
Continued by record of Andrew Currence Coal Test No. 11 (15) (2092' B.):						
30. Surface boulders and sand	6	3	745	3		
31. Fire clay, broken up, soft	2	9	748	0		

No.	Description		Thickness, Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
32.	Coal -------2′ 2″	Sewell (Sharon)	3	2	751	2	60	2
33.	Coal and slate mixed --1 0							
34.	Fire clay, broken up ------------		18	0	769	2		
35.	Fire clay, little streaks of gray sandstone ------------------		11	0	780	2		
36.	Slate and fire clay --------------		3	2	783	4		
37.	Fire clay and gray sandstone, mixed ----------------------		23	9	807	1		
38.	Slate, sandy --------------------		11	11	819	0		
39.	Sandstone, gray, with streaks of of slate--10′ 8″	Welch Sandstone	33	11	852	11		
40.	Slate, sandy- 2 8							
41.	Sandstone, gray ---- 6 11							
42.	Slate, sandy- 2 8							
43.	Sandstone, gray ----11 0							
44.	Fire clay and slate, mixed and trace of coal ----------------		23	8	876	7		
45.	Bone coal, Welch ---------------		0	2	876	9½	125	7½
46.	Fire clay ------------------------		8	0	884	9½		
47.	Bone and coal, mixed, streaks of slate --------------------		1	9	886	6½		
48.	Slate ---------------------------		2	5	888	11½		
49.	Sandstone, gray -----15′ 7″	Upper Raleigh (Sharon) Sandstone	26	11	915	10½	39	1
50.	Conglomerate, very coarse 0 6							
51.	Slate, sandy-- 1 2							
52.	Sandstone, gray ----- 0 5							
53.	Conglomerate, coarse --- 1 0							
54.	Sandstone, gray ----- 5 8							
55.	Conglomerate, coarse --- 2 7							
	Mauch Chunk Series—Bluestone Group (61′ 6″)							
56.	Slate, sandy ---------------------		2	9	918	7½		
57.	Green sandstone and shale ------		58	9	977	4½		
	Mauch Chunk Series—Princeton Conglomerate (43′ 1″)							
58.	Sandstone, Princeton, gray ------		43	1	1020	5½		
	Mauch Chunk Series—Hinton Group (14′ 4″)							
59.	Fire clay, greenish cast --------		9	0	1029	5½		
60.	Sandstone, gray, to red beds ----		5	4	1034	9½		

Cassity Fork Section.

Middle Fork District; starting at the edge of the plateau on the Fisher-Cassity road 2.3 miles northeast of Cassity and extending southwestward along this road to Cassity Fork near the mouth of

Mulberry Fork; measured with aneroid by David B. Reger and D. D. Teets, Jr., along strike of rocks and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Allegheny Series (----')			
1. **Coal blossom, Lower Kittanning** (2525' B.)	--	--	
Pottsville Series—Kanawha Group (336'+)			
2. **Sandstone, Homewood,** massive, great cliff	40	40	
3. Concealed	15	55	
4. **Coal blossom, Upper Mercer** (2470' B.)	--	55	55
5. Concealed	35	90	
6. **Sandstone, Upper Connoquenessing,** massive, cliff rock	80	170	
7. **Coal blossom, Quakertown** (2355' B.)	--	170	115
8. Concealed and fire clay	25	195	
9. **Coal blossom, Chilton?,** streak (2330' B.)	--	195	25
10. Fire clay and concealed	25	220	
11. Slate, black (2300' B.)	--	220	
12. Shale, sandy, and concealed	75	295	
13. Slate, black, hard, laminated	4	299	
14. **Coal, Cedar Grove,** good, (1' 0"), (2220' B.)	1	300	105
15. Fire clay	2	302	
16. Sandstone, hard	2	304	
17. Shale, sandy, with limestone nodules	11	315	
18. **Coal** (0' 4"), (2205' B.)	--	315	15
19. Shale, dark	4	319	
20. **Sandstone, Peerless,** massive	6	325	
21. **Coal, Alma** (0' 7"), (2194' B.)	1	326	11
22. Shale, dark, sandy, with limestone nodules	8	334	
23. Sandstone to creek	2	336	

Laurel Branch of Middle Fork Section.

Middle Fork District; starting at the top of the mountain west of Middle Fork River and extending eastward to the mouth of Laurel Branch two miles northeast of Adolph, then continued with record of John Fincham No. 14 (20) Coal Test Boring drilled by Davis Colliery Company; surface portion measured with aneroid by D. D. Teets, Jr.; arrangement in descending stratigraphic order.

	Thickness. Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
Pottsville Series—Kanawha Group (450' 0"+)						
1. **Sandstone, Upper Connoquenessing,** massive	30	0	30	0	30	0
2. Concealed and sandstone	25	0	55	0		
3. **Sandstone, Lower Connoquenessing, (Lower Winifrede?),** massive	30	0	85	0		
4. Concealed	35	0	120	0		
5. Sandstone, and concealed (mostly sandstone)	25	0	145	0		
6. Bench, concealed	5	0	150	0		
7. Concealed and sandy shale	70	0	220	0		
8. Bench, concealed	5	0	225	0		

		Thickness. Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
9.	Concealed	79	6	304	6		
10.	Slate, gray	0	6	305	0		
11.	**Coal, Campbell Creek (Peerless Bench)** (John Fincham Mine, **No. 88 on Map II)**	2	6	307	6	277	6
12.	Concealed	62	6	370	0		
13.	Bench, concealed	5	0	375	0		
14.	Concealed	75	0	450	0		
Pottsville Series—New River Group (368′ 5″)							
15.	Sandstone and sandy shale	30	0	480	0		
16.	Concealed	23	0	503	0		
17.	Slate, black, **Hughes Ferry Coal horizon**	2	0	505	0	197	6
18.	**Sandstone, Middle Iaeger, flaggy**	28	0	533	0		
19.	Slate, black, to top of coal test	13	0	546	0		
	Continued by John Fincham No. 14 (20) Coal Test Record (2214′ L.):						
20.	Surface clay, sand, and boulders	4	2	550	2		
21.	**Sandstone, Harvey,** gray, streaks of slate	7	6	557	8		
22.	Slate, little streaks of sandstone	12	0	569	8		
23.	Fire clay	2	11	572	7		
24.	Slate and fire clay	0	10	573	5		
25.	**Coal, Castle**	1	0	574	5	69	5
26.	Fire clay, broken up, very soft	12	10	587	3		
27.	Sandstone, gray, and fire clay, mixed	10	7	597	10		
28.	Slate and fire clay, mixed	4	7	602	5		
29.	Fire clay	1	10	604	3		
30.	**Sandstone, Guyandot,** gray	23	6	627	9		
31.	Slate	26	7	654	4		
32.	**Coal and slate, mixed, Sewell "B"**	1	8	656	0	81	7
33.	Fire clay	6	6	662	6		
34.	Sandstone, gray ..... 34′ 3″						
35.	Sandstone, gray, and pea conglomerate, mixed, very hard 12 9						
36.	Conglomerate, pea, very hard 4 0						
	Lower Guyandot (34–36)	51	0	713	6		
37.	**Coal** ..... 0′ 2″						
38.	Conglomerate, pea, very hard 1 9						
39.	**Coal** 0 2						
	Sewell (Sharon) (37–39)	2	1	715	7	59	7
40.	Conglomerate, pea, very hard	0	4	715	11		
41.	Sandstone, fine-grained, very hard	7	9	723	8		
42.	Sandstone, gray	4	3	727	11		
43.	Slate, fire clay, sandstone, broken up	9	6	737	5		

		Thickness. Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
44.	Sandstone, gray, broken up, very hard ----11′ 0″						
45.	Sandstone, gray, full of spots of fire clay, sulphur ---- 3 10						
46.	Sandstone, gray ----19 0						
47.	Conglomerate 4 3						
48.	Sandstone, gray, and streaks of slate ---- 4 10						
49.	Sandstone, gray ----38 1						
	Upper Raleigh (Sharon)	81	0	818	5	102	10
	Mauch Chunk Series—Bluestone Group (48′ 2″)						
50.	Slate, sandy, and fire clay ------	13	3	831	8		
51.	Fire clay ----------------------	3	6	835	2		
52.	Fire clay and green shale, mixed	5	11	841	1		
53.	Fire clay, very soft ------------	7	0	848	1		
54.	Fire clay and green shale, mixed	5	0	853	1		
55.	Fire clay and streaks of green sandstone ------------------	13	6	866	7		
	Mauch Chunk Series—Princeton Conglomerate (59′ 1″)						
56.	Sandstone, gray ---------------	9	1	875	8		
57.	Sandstone, gray, mixed ----------	14	2	889	10		
58.	Conglomerate and sandstone, mixed -----------------------	3	5	893	3		
59.	Sandstone, gray, spots of conglomerate ------------------	28	6	921	9		
60.	Fire clay and sandstone, mixed, to red beds ----------------	3	11	925	8		

Adolph Section.

Middle Fork District; starting at the top of a high point west of Middle Fork River and 1.3 miles north of Adolph and extending southeastward to the river at mouth of Schoolcraft Run; thence continued with record of K. E. Zickefoose No. 13 (21) Coal Test Boring located in Adolph and drilled by Davis Colliery Company; surface portion measured with aneroid by David B. Reger; arrangement in descending stratigraphic order.

		Thickness. Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
	Pottsville Series—Kanawha Group (496′ 0″+)						
1.	Sandstone, Upper Connoquenessing, massive, (15′ visible), and concealed in bluff-------	75	0	75	0	75	0
2.	Bench -------------------------	--	--	75	0		
3.	Steep bluff --------------------	70	0	145	0		

		Thickness, Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
4.	Bench	5	0	150	0		
5.	Steep bluff	125	0	275	0		
6.	Bench	5	0	280	0		
7.	Concealed in bluff	85	0	365	0		
8.	**Coal prospect, fallen shut, mostly black slate, Eagle (2415′ B.)**	--	--	365	0	290	0
9.	Concealed	125	0	490	0		
10.	Slate, black	4	8	494	8		
11.	**Coal, Gilbert** (2295′ B.)	1	4	496	0	131	0
Pottsville Series—New River Group (359′ 11″+)							
12.	**Sandstone, Nuttall,** and concealed to stratigraphic level of boring	39	0	535	0		
	Continued by K. E. Zickefoose No. 13 (21) Coal Test Record (2323′ L.):						
13.	Surface, boulders, and sand	7	7	542	7		
14.	Slate and little seams of gray sandstone	7	1	549	8		
15.	**Coal, Hughes Ferry**	1	7	551	3	55	3
16	Slate	13	11	565	2		
17.	Sandstone, gray, broken --14′ 8″ } **Middle Iaeger**						
18.	Sandstone, gray ----17 10 } **Middle Iaeger**	32	6	597	8		
19.	Slate, fire clay, spots of gray sandstone	5	6	603	2		
20.	Slate	17	1	620	3		
21.	**Sandstone, Harvey,** gray, streaks of slate	14	9	635	0		
22.	Fire clay and slate	3	4	638	4		
23.	**Coal** ----------1′ 0″ } **Castle**						
24.	Slate ---------0 7½ } **Castle**	2	0	640	4	89	1
25.	**Coal,** bony ----0 4½ } **Castle**						
26.	Fire clay, very soft, broken	10	3	650	7		
27.	Sandstone, dark, and fire clay	5	8	656	3		
28.	Sandstone, dark-gray	25	10	682	1		
29.	Slate and fire clay	12	8	694	9		
30.	**Sandstone, Guyandot,** gray, and streaks of slate	10	9	705	6		
31.	**Slate and bony coal, Sewell "B"**	0	4½	705	10½	65	6½
32.	Fire clay, very sandy	5	8½	711	7		
33.	Fire clay and slate	15	2	726	9		
34.	Sandstone, gray -----16′ 6″ } **Lower Guyandot**						
35.	Sandstone, gray, and little trace of coal --- 6 8 } **Lower Guyandot**	23	2	749	11		
36.	Fire clay, **Hartridge Shale**	5	8	755	7		
37.	**Coal, Sewell,** slaty	2	7	758	2	52	4½
38.	Fire clay	8	5	766	7		

			Thickness, Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
39. Sandstone, gray	29′	6″						
40. Slate and streaks of gray sandstone	2	7						
41. Sandstone, gray, and streaks of slate	21	8						
42. Slate	4	2						
43. Slate and sandstone, mixed	4	2	Upper Raleigh (Sharon)	89	4	855	11	
44. Sandstone, gray, and streaks of slate, mixed	3	5						
45. Sandstone, gray, very hard, to bottom	23	10						

Big Laurel Thicket Section.

Middle Fork District; starting at the Big Laurel Thicket and extending eastward to Middle Fork River at the last settlement 2.5 miles south of Adolph; measured with aneroid by David B. Reger along approximate strike of rocks and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (515′+)			
1. **Sandstone, Upper Connoquenessing**, massive, pebbly, cliff rock	70	70	70
2. Concealed in bench	5	75	
3. Steep bluff, with sandstone	65	140	
4. Spring	--	140	
5. Concealed	253	393	
6. **Sandstone, Eagle,** shaly	4.5	397.5	
7. **Coal,** soft, columnar 2′ 0″; 8. Slate, dark 0 2; 9. **Coal** 0 4 — **Eagle** (2675′ B.) (Simeon Kittle **Mine, No. 134** on Map II)	2.5	400	330
10. Concealed	49	449	
11. **Coal,** (2625′ B.), reported	1	450	50
12. Concealed	64	514	
13. **Coal, Gilbert,** (2560′ B.), (reported, 0′ 10″)	1	515	65
Pottsville Series—New River Group (25′+)			
14. Concealed	23	538	
15. **Coal,** in river, **Hughes Ferry,** (2535′ B.), (reported, 1′ 8″)	2	540	25

Hartridge Section.

Middle Fork District; starting at the top of the mountain just southeast of Hartridge on Left Fork of Buckhannon River and extending northwestward to level of Elkhorn Coal Corporation No. 1 (25) Coal Test Boring with the record of which the section is continued; surface portion measured with aneroid by D. D. Teets, Jr., across horizontal beds; arrangement in descending stratigraphic order.

	Thickness. Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
Pottsville Series—Kanawha Group (420′ 1″+)						
1. Concealed	35	0	35	0		
2. Sandstone, massive, medium-grained	35	0	70	0		
3. Concealed	110	0	180	0		
4. Sandstone, massive	25	0	205	0		
5. Concealed to top of hole	30	0	235	0		
Continued by Elkhorn Coal Corporation No. 1 (25) Coal Test Record (3175′ B.):						
6. Boulders	30	0	265	0		
7. Sandstone, Eagle	18	0	283	0		
8. Shale	5	0	288	0		
9. Slate, Newlon, black	1	0	289	0		
10. Coal, Eagle, bony	1	2	290	2	290	2
11. Slate	0	6	290	8		
12. Shale	4	4	295	0		
13. Sandstone, Decota	28	0	323	0		
14. Shale	1	0	324	0		
15. Sandstone	1	1	325	1		
16. Lime and shale	15	0	340	1		
17. Shale	80	0	420	1		
Pottsville Series—New River Group (223′ 1″)						
18. Sand and shale	2	0	422	1		
19. Sandstone	1	0	423	1		
20. Coal, Hughes Ferry	2	4	425	5	135	3
21. Shale	34	7	460	0		
22. Coal, Lower Iaeger	1	6	461	6	36	1
23. Shale	21	6	483	0		
24. Sandstone	1	0	484	0		
25. Shale	0	7	484	7		
26. Sandstone	0	6	485	1		
27. Shale, black	3	0	488	1		
28. Shale, gray	3	0	491	1		
29. Sandstone	4	0	495	1		
30. Shale	30	0	525	1		
31. Sandstone, Harvey	35	0	560	1		
32. Slate	1	1	561	2		
33. Coal, Castle	0	8	561	10		
34. Shale	9	0	570	10		
35. Coal, Sewell "B"	0	7	571	5	109	11
36. Shale	21	0	592	5		
37. Sandstone	1	7	594	0		
38. Shale, Hartridge	12	2	606	2		
39. Coal, Sewell (Sharon)	2	4	608	6	37	1
40. Shale, dark	34	8	643	2		

	Thickness, Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
Mauch Chunk Series—Bluestone Group (16′ 0″)						
41. Shale, red	10	0	653	2		
42. Shale, dark	6	0	659	2		
Mauch Chunk Series—Princeton Conglomerate (20′ 0″)						
43. Sandstone, Princeton	20	0	679	2		
Mauch Chunk Series—Hinton Group (6′ 0″+)						
44. Shale, red and green	6	0	685	2		

Czar Section.

Middle Fork District; starting on hill 0.6 mile west of Czar and extending down road to Left Fork of Right Fork of Buckhannon River at Czar; measured with aneroid by D. D. Teets, Jr., over approximately horizontal strata and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (445′+)			
1. Concealed	25	25	
2. Sandstone, gray, flaggy	35	60	
3. Shale, sandy	5	65	
4. Sandstone, Peerless, massive, coarse-grained	35	100	
5. Shale, sandy, and sandstone	39	139	
6. Coal blossom, Alma (2475′ B.)	1	140	140
7. Shale, gray, sandy	45	185	
8. Sandstone, Monitor	5	190	
9. Shale, gray, sandy	19.5	209.5	
10. Coal blossom, Campbell Creek (Peerless Bench) (2405′ B.)	0.5	210	70
11. Shale, sandy, and concealed	37	247	
12. Fire clay	3	250	
13. Shale, sandy	35	285	
14. Sandstone, Eagle, massive, medium-grained	50	335	
15. Shale and slate, Newlon	18.5	353.5	
16. Coal, Eagle, (2245′ B.)	1.5	355	145
17. Shale, sandy, and concealed	75	430	
18. Sandstone, Lower Gilbert, massive, fine-grained	8	438	
19. Slate, dark, to bottom	7	445	

Trout Run Section.

Middle Fork District; starting at the top of a hill one mile south of Czar and extending eastward to forks of Trout Run of Left Fork of Right Fork of Buckhannon River; measured with aneroid by D. D. Teets, Jr., along strike of rocks and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (550′+)			
1. Sandstone, Upper Connoquenessing, massive	20	20	20
2. Concealed	80	100	

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
3.	Sandstone and concealed, bluff	20	120	
4.	Concealed	80	200	
5.	Bench, concealed	5	205	
6.	Concealed	95	300	
7.	Slate	5	305	
8.	Coal, soft 1' 6"			
9.	Slate, gray 0 6	5	310	290
10.	Coal, soft 3 0 (8–10: Alma (2570' B.) (reported section) (J. J. Wuerzer opening, No. 72 on Map II))			
11.	Concealed and sandstone	135	445	
12.	Slate, black	2.5	447.5	
13.	Coal, bony 0' 4"			
14.	Coal, soft 2 2 (13–14: Eagle (2' 6") (J. J. Wuerzer opening, No. 139 on Map II))	2.5	450	140
15.	Concealed to run	100	550	

Helvetia Section.

Middle Fork District; starting at the top of a hill one mile southwest of Helvetia and extending northeastward down the road to that village; measured with aneroid by D. D. Teets, Jr., along strike of rocks and arranged in descending stratigraphic order.

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (355'+)				
1.	Shale, sandy	65	65	
2.	Bench, concealed	5	70	
3.	Sandstone, and sandy shale	35	105	
4.	Sandstone, massive cliff, gray, medium-grained	20	125	
5.	Bench, concealed	10	135	
6.	Shale, sandy, and concealed	40	175	
7.	Bench, sandy shale	5	180	
8.	Shale, sandy, and concealed	40	220	
9.	Bench, concealed	10	230	
10.	Shale, sandy, and sandstone	85	315	
11.	Bench, concealed	5	320	
12.	Shale, sandy and concealed	30	350	
13.	Bench, shale, sandy	5	355	
Pottsville Series—New River Group (180'+)				
14.	Shale, sandy, and sandstone, Nuttall?	50	405	405
15.	Bench, concealed, and sandy shale	10	415	
16.	Shale, sandy, and sandstone, Harvey	55	470	65
17.	Concealed, bench	5	475	
18.	Shale, slaty, dark	34	509	
19.	Coal blossom, Castle, (2265' B.)	1	510	40
20.	Concealed and sandy shale, to run	25	535	

Silica Section.

Middle Fork District; starting at sand quarry one-half mile southeast of Silica and extending westward to Right Fork of Buckhannon River the two McCauley mines which are located just north of the village being inserted at their proper geological horizons; measured with aneroid by David B. Reger and D. D. Teets, Jr., along approximate strike of rocks and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (580'+)			
1. Sandstone, Homewood, massive, coarse, soft, pebbly, quarry rock	40	40	
2. Concealed and shale	3	43	
3. Coal, Upper Mercer, soft, columnar, (J. A. McCauley Mine, No. 49 on Map II), (3' 4")	3	46	46
4. Concealed	24	70	
5. Sandstone, Upper Connoquenessing, massive	15	85	
6. Concealed	70	155	
7. Coal prospect, Quakertown, thickness concealed	--	155	109
8. Concealed	136	291	
9. Shale, dark, sandy	7	298	
10. Concealed	120	418	
11. Coal, Campbell Creek (Peerless Bench), splinty, (2' 2"), (R. T. McCauley Mine, No. 97 on Map II	2	420	265
12. Concealed	80	500	
13. Sandstone, Eagle, massive	60	560	
14. Shale, Newlon, black, sandy, to river	16	576	
15. Coal, Eagle, (2360' B.), reported in river, (Prospect No. 143 on Map II)	4	580	160

The following section, exhibiting a vertical column of more than a mile, was previously published in the Webster Report of the Survey, pages 71-72. In the present version certain additional correlations have been made, particularly in the Mauch Chunk Series which has been much more carefully studied in recent years:

Arvondale Junction Section.

Middle Fork District; starting at a triangulation point near the common corner of Webster, Upshur, and Randolph Counties and extending eastward down Devil Fork to Arvondale Junction on Buckhannon River and thence continued with the record of the Mayton Lumber Company No. 4903 (13) well which was drilled by the Hope Natural Gas Company and was plugged and abandoned; surface portion measured with aneroid by D. D. Teets, Jr., the intervals in this portion being slightly less than true vertical measurement would show, owing to rise of rocks along line of traverse; arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Allegheny Series (70'+)			
1. Concealed	30	30	
2. Shale, sandy, and concealed	20	50	
3. Slate, black	3.5	53.5	

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
4. Coal, soft ----- 1′ 3″; 5. Coal, bony and slaty ------ 2 3; 6. Coal, soft ----- 3 0 — (6′ 6″) Lower Kittanning (2730′ B.). (D. S. Thomas Mine)	6.5	60	60
7. Shale and concealed	10	70	
Pottsville Series—Kanawha Group (612′)			
8. Sandstone, Homewood, massive, pebbly	20	90	
9. Shale and concealed	15	105	
10. Concealed, bench	5	110	
11. Shale, sandy, and concealed	40	150	
12. Bench, concealed	5	155	
13. Shale, sandy, and sandstone, Upper Connoquenessing, (Upper Coalburg?)	40	195	135
14. Shale, sandy, and concealed	40	235	
15. Sandstone	15	250	
16. Shale, sandy, and sandstone	15	265	
17. Sandstone, flaggy	15	280	
18. Shale, sandy, and concealed	35	315	
19. Concealed, bench	10	325	
20. Shale, sandy, and sandstone	40	365	
21. Concealed	10	375	
22. Sandstone	20	395	
23. Shale, sandy, and concealed	50	445	
24. Sandstone, massive, medium-grained	30	475	
25. Shale, Newlon, dark, cannelly, with Lingula fossils near top	12	487	292
26. Sandstone, to run (2300′ B.)	3	490	
27. Interval, (should contain Eagle Coal)	35	525	
Continued by Mayton Lumber Company No. 4903 (13) Well Record (2265′ B.):			
28. Sand, Lower Gilbert and Dotson, hard (water, 94′)	150	675	
29. Lime, white, hard	7	682	
Pottsville Series—New River Group (453′)			
30. Sand, white, hard (10″ casing, 170′) ---------- 13′; 31. Sand, dark, hard -- 20; 32. Sand, white, hard (water, 210′) --160 — Upper and Lower Nuttall	193	875	
33. Slate, black	110	985	
34. Slate, Sewell Coal horizon, dark	10	995	508
35. Sand, Rosedale Salt, Upper Raleigh, gray	140	1135	
Mauch Chunk Series (671′)			
36. Slate	20	1155	
37. Lime, gritty, (8¼″ casing, 670′)	55	1210	
38. Sand, gray, Princeton	15	1225	
39. Slate, gray	50	1275	
40. Lime, gray	40	1315	
41. Slate, light	30	1345	
42. Lime, light	40	1385	
43. Gray (?)	40	1425	
44. Red rock	190	1615	
45. Lime, white	20	1635	640

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
46. Sand, Maxton (Droop)	44	1679	
47. Slate and shells	78	1757	
48. Sand, Webster Springs	14	1771	
49. Slate	12	1783	
50. Little Lime, (Glenray)	10	1793	
51. Slate, and shells	13	1806	171
Greenbrier Series (60′)			
52. Big Lime	60	1866	
Pocono Series (61′)			
53. Sand, Weir	61	1927	
Catskill Series (673′)			
54. Unrecorded	673	2600	
Chemung Series (2874′)			
55. Sand, Elizabeth (Hendricks), gray (6⅝″ casing, 2081′)	16	2616	
56. Slate and shells	64	2680	874
57. Sand, gray	8	2688	
58. Slate and shells	232	2920	
59. Lime, white	80	3000	
60. Sand, Warren First?, white	50	3050	
61. Slate and shells	858	3908	1228
62. Sand, gray, Speechley (oil at 3393′)	27	3935	
63. Slate	325	4260	
64. Unrecorded	13	4273	
65. Sand, dark-gray	6	4279	
66. Slate and shells	14	4293	385
67. Sand, Riley, Sheffield?, gray	14	4307	
68. Slate and shells	218	4525	
69. Slate, soft, black	275	4800	
70. Lime, gritty	35	4835	
71. Slate and shells	80	4915	
72. Slate	240	5155	
73. Slate and shells	295	5450	
74. Unrecorded to bottom of hole	24	5474	

MEASURED SECTIONS, NEW INTEREST DISTRICT.

New Interest District occupies the extreme northern corner of the county next to Tucker and Barbour Counties. Its surface geology, with the exception of the western edge along the slope of Laurel Ridge where there is a fringe of Pennsylvanian and Mississippian, is that of the Upper Devonian. These sediments are sharply folded and locally wrinkled by the Deer Park Anticline and afford no favorable opportunity for accurate measurement, as the exposures are not good. In general they differ but little from their occurrence farther south in Tygart Valley where they have been carefully recorded in the sections of Leadsville and other districts.

MEASURED SECTIONS, LEADSVILLE DISTRICT.

Leadsville District lies south of New Interest and occupies a portion of the valleys of Leading Creek and Tygart River as well as including part of the Laurel Ridge and other hill country farther west. The western end contains exposures of Allegheny and Pottsville, followed to the eastward by outcrops of Mississippian and Devonian. In certain localities, particularly in the gap of Tygart River, there are good opportunities for the measurement of its rocks.

The four following sections have been previously published in the Barbour, Upshur and Western Randolph Report, pages 161-164. In the present Report they are revised to suit more advanced knowledge and also to correspond to mine and core test numbers as used on Map II:

Gage Section.

Leadsville District; starting at top of point east of Kaufman Church on east side of Tygart River one mile south of Gage and extending westward to Coberly No. 1 Coal Test Boring (45) and thence continued with record of the same; surface portion measured with hand-level by David B. Reger and D. D. Teets, Jr., and arranged in descending stratigraphic order; section of Lower Kittanning Coal in mine of Gage Coal & Coke Company substituted for imperfect coal exposure on hillside.

	Thickness. Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
Allegheny Series (142′ 1″+)						
1. Concealed from top of hill	100	0	100	0		
2. Coal, cannel 0′ 10″ 3. Slate, black 0 10 4. Bone 0 5 5. Coal, soft 2 6 6. Slate, dark 0 10 7. Coal, soft 1 0 8. Slate, dark 0 4 9. Coal, "knee deep" 0 4 Lower Kittanning (Gage Coal & Coke Co. Mine)	7	1	107	1	107	1
10. Concealed	35	0	142	1		
Pottsville Series—Kanawha Group (344′ 5″+)						
11. Sandstone, Homewood, massive, great cliff, quarry rock	50	0	192	1		
12. Concealed	53	0	245	1		
13. Sandstone, Upper Connoquenessing, massive, great pebbly cliff	30	0	275	1		
Continued by Coberly No. 1 (45) Coal Test Record (1750′ B.):						
14. Red surface clay and small boulders	7	4	282	5		

No.			Thickness, Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
15.	Small-pebbled conglomerate rock 15′ 3″	Upper Connoquenessing	69	0	351	5		
16.	Clay, blue, soft and smooth 1 2							
17.	Small-pebbled conglomerate rock 26 3							
18.	Fire clay, soft, light 1 10							
19.	Small-pebbled conglomerate rock 10 8							
20.	Sandrock, fine-grained, gray 13 10							
21.	**Slate, Quakertown, black**		2	0	353	5		
22.	Sandrock, hard, gray		0	6	353	11		
23.	Slate, black		1	8	355	7		
24.	Slate, sandy, dark		6	0	361	7		
25.	**Coal, Quakertown**		0	4	361	11	254	10
26.	Slate, black		1	0	362	11		
27.	Shale, dark-gray		12	0	374	11		
28.	Sandstone, hard, dark, fine-grained 1′ 2″	**Lower Connoquenessing (Lower Winifrede?)**	38	7	413	6		
29.	Sandstone, hard, gray 37 5							
30.	Slate, sandy, dark		1	10	415	4		
31.	**Sandstone, Upper Chilton?,** dark		5	0	420	4		
32.	Slate, dark, sandy		2	6	422	10		
33.	**Sandstone, Upper Cedar Grove?,** gray		0	6	423	4		
34.	Slate, dark, smooth		4	4	427	8		
35.	Slate, black		2	0	429	8		
36.	Slate, dark, sandy		22	11	452	7		
37.	**Sandstone, Brownstown?,** gray, fine		5	9	458	4		
38.	Slate, dark, sandy		7	5	465	9		
39.	**Coal, Powellton**		1	2	466	11	105	0
40.	Slate, dark, sandy		11	11	478	10		
41.	**Coal, Eagle**		2	0	480	10	13	11
42.	Fire clay, light, smooth		3	3	484	1		
43.	**Sandstone, Decota,** dark, to bottom		2	5	486	6		

Laurel Section.

Leadsville District; starting on north side of Tygart River 0.5 mile southeast of Laurel and descending to base of Upper Connoquenessing Sandstone; thence offsetting to base of same sandstone 0.3 mile southeast of Laurel and descending to Western Maryland Railway grade; measured mostly with aneroid by David B. Reger and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Allegheny Series (48'+)			
1. Coal, Lower Kittanning, supplied from south side of river	8	8	8
2. Interval	40	48	
Pottsville Series—Kanawha Group (181'+)			
3. Sandstone, Homewood, massive	50	98	
4. Concealed	10	108	
5. Sandstone, Upper Connoquenessing, massive, pebbly	100	208	
6. Coal, (0" to 0' 4"), Quakertown "Rider", lenticular	--	208	200
7. Shale, gray	1	209	
8. Shale, dark, hard	7	216	
9. Slate, Quakertown, black, with Lingula and Naiadites elongata fossils, very large and numerous	3	219	11
10. Shale, dark, sandy	5	224	
11. Coal, (0' 6"), Quakertown (1780' B.)	0.5	224.5	
12. Fire clay shale to grade	4.5	229	

Harding Section.

Leadsville District; starting at top of hill north of Harding and descending southward to Tygart River; measured with hand-level by David B. Reger along strike of rocks and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Allegheny Series (110'+)			
1. Concealed, with sandstone, from top of hill	80	80	
2. Coal, Lower Kittanning, with partings (1972' L.)	13	93	93
3. Concealed	17	110	
Pottsville Series—Kanawha Group (116'+)			
4. Sandstone, Homewood, massive, cliff rock	35	145	
5. Slate and fire clay, Hammond	3	148	
6. Concealed	13	161	68
7. Sandstone, Upper Connoquenessing, massive, pebbly, cliff rock, to Tygart River	65	226	

Laurel Ridge Section.

Leadsville District; starting at the southern extremity of Laurel Ridge two miles east of Norton and extending southward to Tygart River one-half mile west of Aggregates; measured with aneroid by David B. Reger and D. D. Teets, Jr., along approximate strike of rocks and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series (505′)			
1. Sandstone, Homewood, massive, pebbly, capping ridge	30	30	
2. Concealed	15	45	
3. Sandstone, Upper Connoquenessing, massive, cliff rock	55	100	100
4. Concealed	10	110	
5. Sandstone, Lower Connoquenessing (Lower Winifrede?), massive, cliff rock, with small pebbles	50	160	
6. Concealed	153	313	
7. Shale, Hartridge, dark, with plant fossils	4	317	
8. Coal, Sewell (Sharon), soft, (2′ 8″), (Elkins Electric Railway Co. Mine, No. 278 on Map II), (2093′ B.)	3	320	220
9. Concealed	60	380	
10. Coal prospect, Welch, only a little black slate	--	380	60
11. Concealed	65	445	
12. Sandstone, Upper Raleigh, (Sharon), massive, pebbly	25	470	
13. Concealed	35	505	
14. Coal digging, Fire Creek, abandoned, only a little black slate (1905′ B.)	--	505	125
Mauch Chunk Series (35′)			
15. Concealed to Tygart River	35	540	

The following section represents a careful study of the lower portion of the Pennsylvanian, the entire Mississippian, and the upper two series of the Devonian in the exceptionally good exposures which are afforded in the gap of Tygart River between Rich Mountain and Laurel Ridge and along the State road immediately to the eastward:

Aggregates Section.

Leadsville District; starting at the most northern gap in Rich Mountain 0.7 mile south of Aggregates and extending northeastward to Tygart River one-half mile southeast of Aggregates; thence offsetting to the State road northeast of the river and continuing with this road eastward about 1½ miles. Rich Mountain portion measured mostly with hand-level and corrected for dip; latter portion measured by pacing and vertical angles; dip northwest, 15° to 40°; measured by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—New River Group (154′+)			
1. Sandstone, Lower Guyandot, shaly and flaggy, visible	10	10	
2. Concealed	10	20	
3. Shale, Hartridge, dark, fissile	10	30	
4. Coal, Sewell, Loyd Lantz (Martin Roy)			

No.		Thickness. Feet.	Total. Feet.	Intervals. Feet.
	Mine, No. 279 on Map II (2615′ B.); fallen shut, reported about	3	33	33
5.	Sandstone, Welch, massive, cliff rock, with small quartz pebbles	25	58	
6.	Concealed, with black shale	10	68	
7.	Shale, black	9½	77½	
8.	Coal, Welch, Gates & Bailey Prospect, No. 389 on Map II (2655′ B.); (0′ 6″)	0½	78	45
9.	Concealed, with sandy shale	32	110	
10.	Slate, black, and fire clay at old prospect, thickness concealed	--	110	
11.	Concealed	5	115	
12.	Sandstone, massive, coarse, pebbly ......12′			
13.	Shale, yellow, sandy, partly concealed ......17 — Upper Raleigh (Sharon) Sandstone (12–14)	39	154	76
14.	Sandstone, brown, coarse..10			
	Mauch Chunk Series—Bluestone Group (23′)			
15.	Concealed, partly, with red shale	23	177	
	Mauch Chunk Series—Princeton Conglomerate (28′)			
16.	Sandstone, Princeton, greenish-brown, partly flaggy	28	205	51
	Mauch Chunk Series—Hinton Group (163′)			
17.	Shale, red, partly concealed	121	326	
18.	Sandstone, green, flaggy, visible	2	328	
19.	Concealed	18	346	
20.	Sandstone, Stony Gap?, green, flaggy, fine-grained, cliff rock	22	368	163
	Mauch Chunk Series—Bluefield Group (187′)			
21.	Shale, red, mostly concealed	70	438	
22.	Sandstone, Droop?, green, fine-grained	15	453	
23.	Shale, red, mostly concealed	65	518	
24.	Limestone, Glenray, dark, weathering yellowish; marine fossil fragments (Sample No. 654R)	5	523	
25.	Shale, Lillydale, green and calcareous at top, red at base; numerous marine fossils, pelecypods and brachiopods (Orthotetes, Spirifer, Composita, etc.) (Sample No. 653R across outcrop)	32	555	187
	Greenbrier Series (181′)			
26.	Limestone, Alderson, poorly exposed, mostly dark, weathering yellow; contains marine fossils (crinoids, etc.) (Sample No. 652R across visible exposures)	40	595	
27.	Limestone, Union, (Gasper portion), dark-gray, weathering light, hard, oolitic, pure; contains marine fossils, numerous brachiopods (Productus, Orthotetes, etc.), crinoids, blastoids (Pentremites), trilobites, and fish teeth (Lot 349; tooth identified by Tilton as Petalodus); quarry rock (Sample No. 651R across face of quarry)	14	609	

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
28 **Limestone, Union,** (**Gasper** portion, continued), yellow, shaly, and impure; quarry rock (**Sample No. 650R** across face)	2	611	
29. **Limestone, Union,** (**Gasper** portion, continued), dark-gray, weathering light, hard, oolitic, pure; contains marine fossils; quarry rock (**Sample No. 649R** across face)	14	625	
30. Shale, red, and limestone, siliceous and cross-bedded, with a few fossil fragments in limestone 12′ 31. Limestone, cross-bedded, siliceous; quarry rock (**Sample No. 648R** across face) 6 32. Limestone, impure, with red shale 8 } **Bethel Sandstone stage**	26	651	96
33. **Limestone, Union,** (**Fredonia** portion), dark-gray, slightly siliceous, hard, oolitic at top, dark oily spots and streaks; cross-bedded; contains a few marine fossil fragments; quarry rock (**Sample No. 647R** across face)	35	686	
34. **Limestone, Union,** (**Fredonia** portion, continued), yellow, impure, and siliceous, cavernous, numerous geodes filled with calcite and bituminous residue; many cleavage planes; contains small tree trunks (**Lot 463**) and a few marine fossils, brachiopods; quarry rock (**Sample No. 646R** across face)	22	708	
35. **Limestone, Union,** (**Fredonia** portion, continued), dove-colored, weathering white, oolitic, contains a few small white quartz pebbles; contains scanty marine fossils, crinoids, brachiopods, and blastoids (**Pentremites**); not quarried (**Sample No. 645R** across face)	28	736	85
Pocono Series (70′)			
36. **Sandstone, Broad Ford,** white, massive, hard, largely composed of flat and elongated white quartz pebbles	8	744	
37. **Sandstone, Broad Ford,** greenish-gray, thick-bedded, and concealed	35	779	
38. **Sandstone, Broad Ford,** greenish-gray, thick-bedded	5	784	
39. Concealed and yellow, sandy shale	22	806	
Catskill Series (774′)			
40. Shale, red, with streaks of sandstone, to Tygart River	33	839	

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
	(Section continued along State road northeast of river):			
41.	Concealed	12	851	
42.	Shale, Saxton, green and red, variegated, with a few plant impressions; exposed at cottage	15	866	60
43.	Concealed, mostly, across ravine, with some greenish-brown sandstone	20	886	
44.	Shale, red	15	901	
45.	Sandstone, greenish-brown, very shaly	25	926	
46.	Shale, red, streaked with green	30	956	
47.	Concealed	45	1001	
48.	Sandstone, greenish-brown, cross-bedded, and irregular	15	1016	
49.	Breccia, brown, ferruginous, with green shale chips and a few plant stems	1	1017	
50.	Shale, green	14	1031	
51.	Shale, red, partly concealed	60	1091	
52.	Shale, green, sandy	15	1106	
53.	Sandstone, greenish-gray, thick-bedded	35	1141	
54.	Coal, impure, with numerous plant stems above and below it (0′ 2″)	--	1141	335
55.	Shale, greenish-gray, soft, with some green shale breccia	4	1145	
56.	Sandstone, greenish-brown, massive, soft	25	1170	
57.	Shale, green	5	1175	
58.	Shale, red	15	1190	
59.	Sandstone, green, soft, with streaks of shale	60	1250	
60.	Shale, green, fissile, with plant fossils (Lot 411)	20	1270	
61.	Shale, red, with a little sandstone, partly concealed	150	1420	
62.	Concealed, mostly red shale, to ravine northwest of railroad bridges	160	1580	439
Chemung Series (3147′+)				
63.	Sandstone, Hendricks, greenish-brown, thick-bedded; contains marine fossils, partly in ledge itself and partly in adjacent debris; chunks of white, pebbly, and fossiliferous conglomerate along outcrop; amount of ledge visible	2	1582	
64.	Concealed	1175	2757	
65.	Sandstone, Elkins, (type locality), mostly greenish-brown, fine-grained, thick-bedded or flaggy, with alternating streaks of olive-green shale; occasional ripple-marks; numerous zones of marine fossils, brachiopods, pelecypods, and crinoids and trail markings (Lot 350 from upper 400′; according to Tilton contains Schuchertella chemungensis, Camarotoechia eximia, Atrypa			

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
	spinosa, Spirifer disjunctus, Spirifer mesastrialis, Leptodesma medon?, Cypricardella?); basal 50′ of deposit is quarried in ravine above State road, there being very abundant marine fossils. (Lot 351 from this portion; according to Tilton contains Douvillina cayuta, Productella lachrymosa, Productella sp., Schizophoria striatula, Atrypa spinosa, Spirifer disjunctus, Tentaculites sp.); total thickness	450	3207	1627
66.	Concealed	305	3512	
67.	Shale, greenish-brown, sandy, with sandstone flags, partly concealed; contains marine fossils (Ambocoelia)	385	3897	
68.	Concealed, with fossiliferous sandstone fragments, to ravine at paper-covered house	385	4282	
69.	Concealed, with fossiliferous sandstone fragments, to turn of State road at Floradell Chiropractic Home	445	4727	1520

The following section is prepared principally to show the unconformity in the Mississippian sediments along the old Morgantown Pike where the Greenbrier and Maccrady Series are both absent and where the Pocono is quite thin. Beneath the base of the measured section, there are additional good exposures in the Chemung Series of the Devonian along the pike but accurate measurement would be uncertain on account of the numerous turns of the road and other difficulties:

Morgantown Pike Section.

Leadsville District; starting on the old Morgantown Pike, 0.3 mile southeast of the summit of Laurel Ridge and 3 miles northwest of Gilman, and traversing eastward 0.3 mile down the pike; dip northwest 35° to 40°; thickness partly estimated; measured by David B. Reger and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Mauch Chunk Series (______)			
1. Shale, red, not measured (2555′ B.)	--		--
Unconformity, no Greenbrier or Maccrady Series present			
Pocono Series (111′)			
2. Sandstone, coarse, visible	1		1
3. Concealed, with sandstone fragments	30		31
4. Sandstone, Broad Ford, partly gray, with quartz pebbles, and partly reddish-brown, soft, friable, and ferruginous (2545′ B.); abundant marine fossils			

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
near middle. Lot 352; contains crinoid stems, pelecypod, gastropod (medium spire), Syringothyris textus?, Palaeoneilo sp., Platyceras sp., Orthoceras sp., according to Tilton	50	81	81
5. Shale, Sunbury, dark-gray, fissile (2535′ B.); found one piece of a striated shell	30	111	
Catskill Series (515′)			
6. Shale, red and variegated, with some shaly sandstone	140	251	
7. Sandstone, greenish-brown	15	266	
8. Shale, brown, sandy	15	281	
9. Sandstone, greenish-brown, thick-bedded	30	311	
10. Shale, red, sandy	15	326	
11. Sandstone, shaly	15	341	
12. Shale, red, green, and brown, alternating with thin sandstones	110	451	
13. Shale, greenish-brown	20	471	
14. Shale, red, estimated around turn of road	75	546	
15. Sandstone, reddish-brown	20	566	
16. Shale, red (2455′ B.)	60	626	
Chemung Series (20′+)			
17. Sandstone, Hendricks, greenish-brown, hard, massive, with white quartz pebbles at top; contains marine fossils, brachiopods and long pelecypods	20	646	565

The following section represents a good exposure of about two-thirds of the Chemung Series along the Elkins-Franklin road where there are few confusing turns and where the dips are fairly uniform, affording good conditions for study:

Kelley Mountain Section.

Leadsville District; starting at the gap of Cheat Mountain north of Kelley Mountain 0.5 mile east of Tunnel Station and extending westward along the road about one mile to the foot of the mountain; measured by pacing and vertical angles, corrected for dip, and arranged in descending stratigraphic order by David B. Reger.

Chemung Series (2000′+)

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
1. Sandstone, Hendricks, greenish-brown, massive, pebbly, with marine fossils and plant stems; well exposed in summit cut and on eastern slope of Cheat Mountain	30	30	30
2. Concealed, with olive-green shale and a little sandstone	240	270	
3. Sandstone, greenish-brown, flaggy, fairly coarse	20	290	
4. Shale, olive-green, with a little sandstone	115	405	
5. Concealed	50	455	

	Thick-ness. Feet.	Total. Feet.	Inter-vals. Feet.
6. **Sandstone, Valley Head,** greenish-brown, slightly ferruginous, flaggy and shaly, with marine fossils and tree fragments. Lot 389 of marine fossils; contains plant impressions?, crinoid stems, branching bryozoa, Productella lachrymosa, Dalmanella sp., Camarotoechia sp., Spirifer sp., Pterinea nodocosta, Sphenotus contractus, Cypricardinia elegans, Orthoceras sp., according to Tilton. Lot 390 of plants	45	500	470
7. Concealed, flaggy sandstone, and shale, not examined in detail	1200	1700	
8. **Sandstone, Elkins,** dull-gray or drab, flaggy or thick-bedded, with alternating beds of shale; abundant marine fossils and also stumps of trees. Lot 365 of marine fossils; contains plant impressions (branching algae), Zaphrentis chemungensis, crinoid stems, Fenestella sp., branching bryozoa, encrusting bryozoa, Schizophoria striatula, Leptostrophia perplana var. nervosa, Douvillina cayuta, Productella lachrymosa, Atrypa spinosa, Atrypa hystrix, Spirifer disjunctus, Spirifer mesacostalis, Ambocoelia umbonata, Pterinea chemungensis, according to Tilton. Lot 366 of plants	300	2000	1500

MEASURED SECTIONS, BEVERLY DISTRICT.

Beverly District occupies a portion of Tygart Valley surrounding Beverly and also extends eastward across Cheat Mountain to Shavers Fork of Cheat River. In Tygart Valley its surface geology is principally that of the Mississippian and Devonian but in Cheat Mountain and on Shavers Fork as well as in the crest of Rich Mountain there are areas of Pennsylvanian. The three following sections have been carefully measured at favorable points in this district:

Beverly Section.

Beverly District; starting at summit of Rich Mountain, four miles northwest of Beverly and traversing southwestward along Staunton and Parkersburg Pike to Chemung-Portage contact on Beaver Creek, 1.4 miles northwest of Beverly; dips northwest varying from 5° to 30°; thickness partly estimated and partly computed; measured by David B. Reger and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—New River Group (50'+)			
1. **Sandstone, Upper Raleigh (Sharon)**, white, massive, with quartz pebbles, forming summit of mountain (3025' B.)	50	50	50
Mauch Chunk Series—Bluestone, Princeton, and Hinton Groups (155')			
2. Shale, red	125	175	
3. **Sandstone, Stony Gap?**, greenish-gray, cross-bedded, medium-coarse, fairly hard	30	205	155
Mauch Chunk Series—Bluefield Group (247')			
4. Shale, red, partly concealed	100	305	
5. **Sandstone, Droop?**, reddish-brown at top, green at base, flaggy	25	330	125
6. Shale, red	25	355	
7. **Shale, Ada?**, green, fissile, with a few marine fossils (2865' B.); fragments of pelecypods	10	365	
8. Concealed, with red shale	10	375	
9. **Limestone, Reynolds?**, dark, hard, with marine fossils (2860' B.); brachiopods (fragments of **Spirifer**)	2	377	
10. Concealed, with red shale and a little sandstone (2830' B.)	75	452	122
Greenbrier Series (115')			
11. **Limestone, Union, (Gasper** portion), dark-gray, hard, pure, slightly oolitic, with marine fossils (2820' B.); fragments of brachiopods and crinoids. This bed was once burned for agricultural lime.	30	482	
12. **Limestone, Union, (Gasper** portion), impure, shaly	10	492	
13. **Limestone, Union, (Gasper** portion), gray, hard, somewhat siliceous; quarried for road metal. **Sample No. 663R** from Nos. 11, 12, and 13, land of **Grace Hart Johnson**	20	512	
14. **Limestone, Union, (Bethel** stage); composed of red shale	10	522	
15. **Limestone, Union, (Fredonia** portion), gray, hard, pure, partly oolitic (2795' B.); **Sample No. 664R,** land of **Grace Hart Johnson**	25	547	
16. Concealed, calcareous soil (2780' B.)	20	567	115
Unconformity; no Pocono Series			
Catskill Series (470')			
17. Sandstone and shale, greenish-brown, poorly exposed	15	582	
18. Shale, red, with a little sandstone	100	682	
19. **Shale, Saxton**, pale-green, fissile, with plant fossils (**Archaeopteris**) and also marine fossils (pelecypods) (2715' B.); **Lot 360** of plant and marine fossils	10	692	125

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
20.	Shale, red, with a little sandstone	20	712	
21.	Sandstone, greenish-brown, shaly	15	727	
22.	Shale, red, green, and variegated	30	757	
23.	Sandstone, greenish-brown, shaly	15	772	
24.	Shale, red, with a little sandstone	25	797	
25.	Sandstone, green, shaly, cross-bedded	10	807	
26.	Shale, red and green, with a little sandstone	30	837	
27.	Sandstone, green, medium-coarse, cross-bedded	20	857	
28.	Shale, red, with streaks of shaly sandstone	100	957	
29.	Sandstone, greenish-brown, medium-coarse	20	977	
30.	Shale, red	10	987	
31.	Sandstone, reddish-brown, medium-coarse, cross-bedded	50	1037	345
Chemung Series (2818')				
32.	Shale, olive-green	20	1057	
33.	**Sandstone, Hendricks,** greenish-brown, partly flaggy and partly massive, with white, elongated and flattened quartz pebbles and small black, flattened pebbles, and with thin beds of green shale (2565' B.); numerous marine fossils and a few plant stems. **Lot 361;** contains branching bryozoa (few), **Camarotoechia subarcuata** (numerous), **Sphenotus contractus, Liopteria bigsbyi?, Leptodesma medon** (numerous), **Orthoceras** sp., as identified by Tilton	75	1132	95
34.	Shale, olive-green, with thin sandstones	200	1332	
35.	Sandstone, green, very shaly	15	1347	
36.	Shale, green, with thin streaks of sandstone, some of which are ripple-marked	150	1497	
37.	Sandstone, shaly, with marine fossil fragments	5	1502	
38.	Shale, green	15	1517	
39.	Sandstone, conglomeratic, with white, elongated and flattened quartz pebbles; two streaks separated by 4 feet of shale	8	1525	
40.	Shale, green, partly concealed, with streaks of greenish-brown sandstone containing marine fossils	400	1925	
41.	Sandstone, greenish-brown, very shaly, interlaminated with many beds of shale, and having numerous marine fossils (2350' B.). **Lot 362;** contains crinoid stems, branching bryozoa, **Schuchertella chemungensis** (very abundant), **Productella lachrymosa, Camarotoechia eximia, Spirifer disjunctus, Spirifer mesacotalis, Liopteria bigsbyi,** as identified by Tilton	60	1985	853

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
42.	Shale, olive-green, with beds of shaly sandstone	125	2110	
43.	Sandstone, greenish-brown, weathering reddish-brown, shaly, with marine fossils (2270′ B.). Lot 363; contains crinoid stems, branching bryozoa, Productella lachrymosa, Spirifer mesacostalis, Ambocoelia umbonata, Leptodesma medon, and a pelecypod, according to Tilton	25	2135	150
44.	Shale, olive-green, sandy	75	2210	
45.	Sandstone, greenish-brown, very shaly, with marine fossils; brachiopods (Spirifer, Camarotoechia, etc.), and pelecypods	25	2235	
46.	Shale, olive-green, sandy, with sandstone	100	2335	
47.	Sandstone, greenish-brown, shaly	15	2350	
48.	Shale, olive-green, sandy, with occasional sandstones	400	2750	
49.	Sandstone, shaly, with marine fossils; brachiopods (Spirifer disjunctus, etc.)	15	2765	
50.	Shale, greenish-gray, with thin sandstones	150	2915	
51.	Sandstone, Elkins, greenish-brown, shaly, with marine fossils and a few plants (2045′ B.). Lot 364; contains plant impressions, crinoid stems, Fenestella sp., branching bryozoa, Schizophoria striatula, Leptostrophia perplana var. nervosa, Douvillina cayuta, Productella lachrymosa, Atrypa hystrix, Spirifer disjunctus, Pterinea chemungensis, according to Tilton	75	2990	855
52.	Concealed, mostly shale	400	3390	
53.	Sandstone, green, with marine fossils, brachiopods	5	3395	
54.	Concealed to Beaver Creek bridge (2005′ B.)	150	3545	
55.	Sandstone, flaggy, green, exposed in Beaver Creek	10	3555	
56.	Shale and sandstone, poorly exposed, with marine fossils in sandstone fragments; brachiopods (Spirifer, Schuchertella, Camarotoechia, and Ambocoelia), and crinoids	400	3955	965
Portage Series (______)				
57.	Shale, greenish-gray, fairly soft, not measured	--	----	

Elkhorn School Section.

Beverly District; on western slope of Cheat Mountain starting on flat 0.8 mile southeast of Elkhorn School and extending northwestward to bed of ravine 0.5 mile due east of Elkhorn School; waters of Left Fork of Chenoweth Creek about 5 miles eastward from

Beverly; dip southeast about 12°; measured with aneroid, corrected for dip, and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Mauch Chunk Series—Bluefield Group (245'+)			
1. Shale, red, not measured	--	--	
2. Sandstone, Droop, green, flaggy, makes high shoulder in sod lands (3020' B.).	20	20	20
3. Shale, red, and concealed	110	130	
4. Sandstone, Webster Springs, green, flaggy	15	145	125
5. Concealed	100	245	100
Greenbrier Series (205')			
6. Limestone, Union, (Gasper portion), dove-colored, partly oolitic, coarsely crystalline, poorly exposed; contains a few marine fossils, blastoids (one Pentremites) and crinoids	75	320	
7. Limestone, Union, (Gasper portion), dark, weathering yellow, with marine fossils; one cup coral noted	5	325	
8. Concealed and calcareous sandstone	10	335	
9. Limestone, Union, (Gasper portion), gray, granular, pure, slightly oolitic (2750' B.)	10	345	
10. Limestone, Union, (Bethel Sandstone stage), partly concealed, with a little impure, reddish limestone and reddish sandstone	30	375	130
11. Limestone, Union, (Fredonia portion), gray or dove-colored, weathering white, massive, mostly pure but has rather sandy zone near middle, partly oolitic, contains a few marine fossils; small crinoids and microscopic gastropods. Sample No. 658R collected across outcrop, land of Richard Wamsley (2660' B.)	75	450	75
Unconformity, no Pocono Series present			
Catskill Series (100'+)			
12. Shale, red, and shaly sandstone, red, to bed of ravine (2560' B.)	100	550	

Bemis Section.

Beverly District; starting on a promontory of Cheat Mountain 1.2 miles northwest of Bemis and first extending southeastward 0.5 mile to the old Bemis railroad grade which is now a county road; thence offsetting southwestward with a prospected coal column and thence returning northward with exposures along this grade to the switchback nearly one mile north of Bemis and southward again with the same grade to Bemis; gentle northwest dip, about 2° at top of section and about 10° at base; measured with aneroid, corrected for dip, and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (655')			
1. Sandstone, Homewood, white, massive, pebbly, cliff rock, capping eastern ridge of Cheat Mountain	40	40	40
2. Concealed	15	55	
3. Coal blossom, Stockton? or Upper Mercer? (3640' B.)	--	55	
4. Fire clay shale and concealed	10	65	
5. Sandstone, Upper Connoquenessing, white, massive, with abundant white angular quartz pebbles some of which are ½" in diameter; and with numerous plant stems	100	165	125
6. Concealed	30	195	
7. Sandstone, Upper Winifrede?, partly concealed	35	230	
8. Concealed in slope	50	280	
9. Sandstone, Upper Chilton?, massive, poorly exposed	35	315	
10. Concealed	15	330	
11. Sandstone, Upper Cedar Grove?, white, hard, massive	15	345	180
12. Shale, dark, and concealed in slope	90	435	
13. Sandstone, Eagle?, white, coarse, cliff rock	30	465	
14. Concealed, partly, with sandstone	15	480	
15. Sandstone, Grapevine?, white, massive, pebbly, cliff rock	40	520	
16. Concealed	10	530	
17. Sandstone, Lower Gilbert, white, massive, pebbly, cliff rock (3170' B.)	55	585	
18. Concealed, (horizon of Gilbert Coal)	10	595	250
19. Sandstone, Dotson?, thin-bedded	10	605	
20. Concealed (3110' B.)	50	655	60
Pottsville Series—New River Group (321')			
21. Sandstone, Upper and Lower Nuttall, white, massive, pebbly, cliff rock (3040' B.)	80	735	80
(Thence offsetting a few hundred feet southwestward where the Nuttall Sandstone is only slightly above old Bemis grade and has elevation of 3005' B.)			
22. Shale, Upper Iaeger, dark, sandy, ferruginous	5	740	
23. Concealed	73½	813½	
24. Slate, black, Castle Coal horizon (2925' B.); at Prospect No. 206 on Map II slightly farther west this coal is 1' 6" thick	1½	815	80
25. Concealed	20	835	
26. Shale, Skelt, dark, sandy	3	838	
27. Coal, Sewell "B" (2905' B.), Prospect No. 221 on Map II (2' 4")	2	840	
28. Concealed and dark-gray shale	32	872	

PLATE XV.—View from Point Mountain road just east of Jonathan Knob, Webster County, looking south into the valley of Elk River. High ridge in background is Elk-Gauley divide showing Schooley Peneplain supported by Pottsville Series and followed below by Mauch Chunk Series. (Photo by E. E. Harris.)

PLATE XVI.—View of Cheat Mountain, with Bemis village and flood-plain of Shavers Fork in foreground. Shows entire Pottsville with Homewood Sandstone at top of Mountain. Lower slope is Mauch Chunk. (Photo by E. E. Harris.)

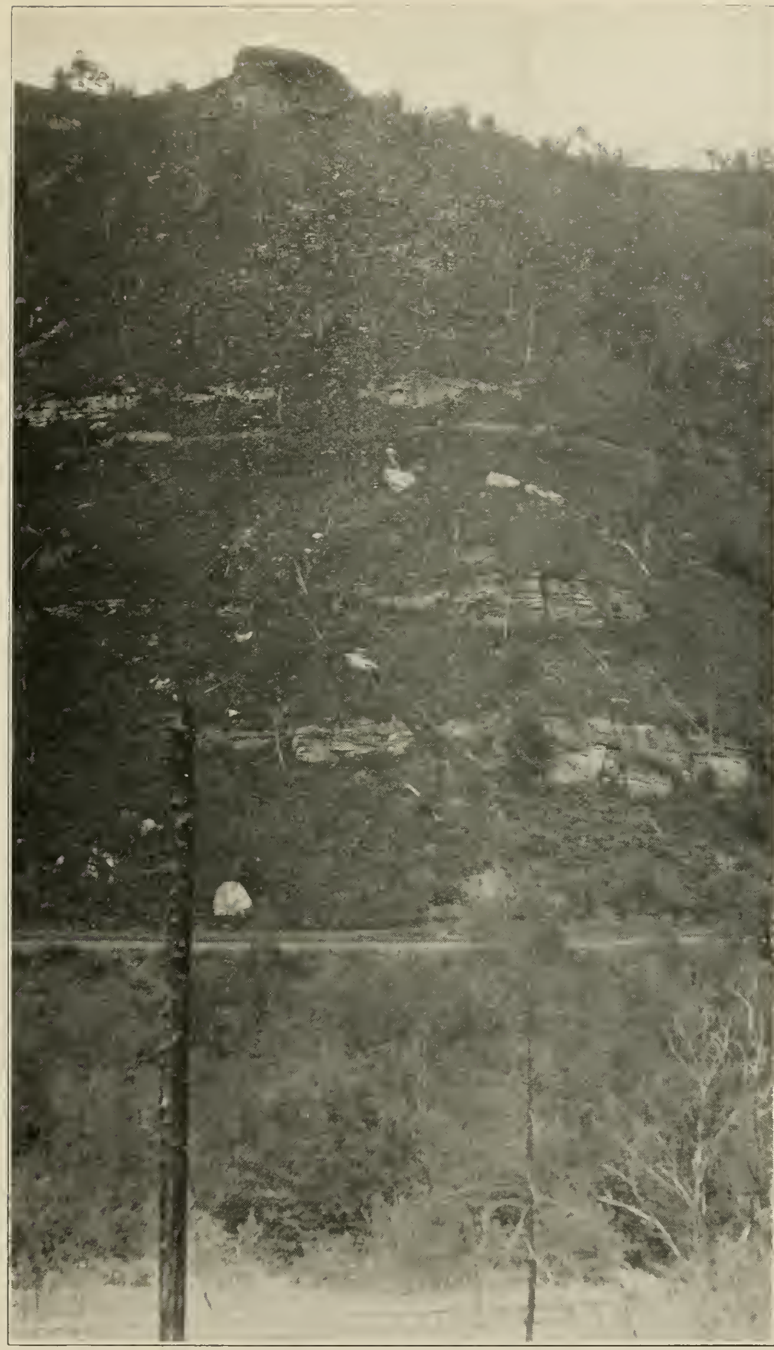

PLATE XVII.—View on Shavers Fork near Cheat Junction, looking west across Shavers Fork toward Cheat Mountain and Pottsville topography. Highest cliff is Upper Connoquenessing Sandstone. Durbin Branch of Western Maryland Railway ascends river on west side and after crossing it shows again in foreground, its grade being in Mauch Chunk Shales. (Photo by E. E. Harris.)

PLATE XVIII.—Pottsville sandstones in point west of Shavers Fork just below Red Roaring Run, looking southwest. Second ledge from bottom is Upper Raleigh (Sharon), followed by Guyandot, Harvey, and Nuttall, with pinnacle of Lower Gilbert? at top. Lower slope is Mauch Chunk. (Photo by E. E. Harris.)

	Thick-ness. Feet.	Total. Feet.	Inter-vals. Feet.
29. Coal, soft, good ---2′ 8″ / 30. Bone ------0 2 — (2′ 10″) Sewell (2875′ B.) Davis Coal Land Company, Prospect No. 299 on Map II	3	875	60
31. Concealed	15	890	
32. Coal prospect, Welch (2860′ B.); little black slate and coal; Prospect No. 401 on Map II	--	890	
33. Concealed, 5′ to	10	900	
34. Sandstone, Upper Raleigh (Sharon), gray, massive, very hard, pebbly, makes cliffs on both sides of Fishinghawk Creek farther west and also just beneath the sharp turn of the old Bemis grade north of Prospect No. 299, about (Section continued with exposures farther north toward switchback):	40	940	
35. Shale, dark	14	954	
36. Coal, Little Raleigh (2870′ B.); Prospect No. 415 on Map II (1′ 6″)	1½	955½	
37. Fire clay shale, concealed, and shale	14	969½	
38. Coal, slaty--1′ 0″ / 39. Shale, dark-3 0 / 40. Coal, bony--1 6 — (5′ 6″) Fire Creek (2850′ B.) Davis Coal Land Co., Prospect No. 419 on Map II	5½	975	100
41. Slate, black, bony	1	976	
Mauch Chunk Series—Princeton Conglomerate (50′)			
42. Sandstone, Princeton, massive, pebbly	25	1001	
43. Concealed	5	1006	
44. Sandstone, Princeton, (continued), massive, cliff	20	1026	51
Mauch Chunk Series—Hinton Group (405′+)			
45. Shale, Terry Shale and Limestone, green, sandy, with calcareous lenses containing abundant marine fossils (2720′ B.). Lot 379; contains crinoid stems, Orthotetes kaskaskiensis, Cliothyridina sublamellosa?, as identified by Tilton	30	1056	
46. Sandstone, Falls Mills?, massive	5	1061	35
47. Shale, green, and concealed	25	1086	
48. Shale, red	35	1121	
49. Sandstone, Tallery?, green, massive	5	1126	
50. Shale, red, and concealed	100	1226	
51. Sandstone, Goodwyn, green, massive, makes bluff north of Fishinghawk Creek at road fork slightly west of Bemis station (2600′ B.)	30	1256	195
52. Concealed across valley of Shavers Fork, estimated	125	1381	
53. Sandstone, Upper Bellepoint?, massive, visible on east side of Shavers Fork	20	1401	145
54. Concealed	15	1416	

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
55. Sandstone, Stony Gap, grayish-white, very hard, visible partly on east side of Shavers Fork and partly in bed of Shavers Fork east of Bemis station (2540' B.); base not exposed	15	1431	

MEASURED SECTIONS, VALLEY BEND DISTRICT.

Valley Bend District lies south of Beverly District and extends from the summit of Rich Mountain on the west across Tygart Valley, Cheat Mountain, Shavers Fork and eastward to Shavers Mountain. It has varied outcrops of Pennsylvanian, Mississippian, and Devonian rocks but in general the exposures are not well adapted to careful stratigraphic measurement. The following section, however, illustrates the nature of the Pottsville and upper portion of the Mauch Chunk along Shavers Fork above Bemis:

Cheat Junction Section.

Valley Bend District; starting at top of a high eastern spur of Cheat Mountain 0.7 mile northwest of Cheat Junction and extending southeastward to Shavers Fork of Cheat River 0.4 mile southwest of Cheat Junction; intervals represent approximately true vertical measurement because of short line of traverse; measured with hand-level and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (405'+)			
1. Sandstone, Upper Connoquenessing, massive, pebbly, capping mountain	125	125	125
2. Coal blossom, Chilton?, (3498' B.)	--	125	
3. Concealed	66	191	
4. Coal blossom, Cedar Grove (3432' B.)	--	191	
5. Shale and concealed	5	196	
6. Sandstone, Brownstown, massive, cliff	50	246	
7. Concealed	66	312	
8. Coal blossom, Eagle (3311' B.)	--	312	187
9. Sandstone, Decota, shaly	7	319	
10. Concealed and shale	20	339	
11. Sandstone, Lower Gilbert, massive, cliff	38	377	
12. Concealed	28	405	
13. Coal blossom, Gilbert (3218' B.)	--	405	93
Pottsville Series—New River Group (370')			
14. Sandstone, Nuttall, massive, cliff	27	432	
15. Concealed and sandy shale	50	482	
16. Shale, Lower Iaeger, dark, partly concealed	44	526	
17. Sandstone, Harvey, massive	28	554	149
18. Concealed, mostly shale	66	620	
19. Shale, Hartridge, black, partly concealed	27	647	
20. Coal, Sewell (Sharon), soft, W. Va. Pulp &			

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
	Paper Co. Exposure (No. 306 on Map II) (2974′ B.) (1′ 8″)	2	649	95
21.	Shale	5	654	
22.	Sandstone, Welch, massive, coarse	12	666	
23.	Coal, Welch, lenticular (Exposure No. 402 on Map II) (1′ 0″) (2956′ B.)	1	667	
24.	Shale, dark, with ferruginous nodules	20	687	
25.	Shale, black, with coal streaks	3	690	
26.	Sandstone, Upper Raleigh (Sharon), massive	14	704	
27.	Slate, black 0′ 3″ } (0′ 9″) Little Raleigh Coal			
28.	Coal, soft 0 6 }	1	705	
29.	Shale, dark, sandy, with ferruginous nodules	22	727	
30.	Coal, Beckley, soft, columnar, W. Va. Pulp & Paper Co. Exposure (No. 416 on Map II) (2895′ B.) (0′ 10″)	1	728	
31.	Shale, gray	5	733	
32.	Sandstone, shaly	6	739	
33.	Shale, dark	3	742	
34.	Coal, slaty 0′ 5″ } (2′ 1″) Fire Creek (2879′ B.) W. Va. Pulp & Paper Co. Prospect (No. 420 on Map II)			
35.	Coal, soft, columnar 1 8 }	2	744	95
36.	Concealed, mostly dark shale	31	775	
	Mauch Chunk Series—Hinton Group (158′+)			
37.	Limestone, Pluto, shaly, dark, with marine fossil fragments	1	776	
38.	Shale, red	10	786	
39.	Sandstone, greenish	15	801	
40.	Shale, red, green, variegated and sandy	55	856	
41.	Concealed to Western Maryland Ry. grade	25	881	
42.	Concealed to Shavers Fork of Cheat River (2690′ B.)	52	933	

MEASURED SECTIONS, HUTTONSVILLE DISTRICT.

Huttonsville District lies south of Valley Bend District and extends from the crest of Rich Mountain on the west across Tygart Valley, Cheat Mountain, Shavers Fork and east to the summit of the Shavers Mountain-Back Allegheny range. Its surface rocks include portions of the Pennsylvanian, Mississippian, and Devonian and at some localities the opportunities for measurement are favorable. The three following sections afford a good idea of the Pennsylvanian and Mississippian beds:

Mill Creek Section.

Middle Fork and Huttonsville Districts; starting on the summit of Rich Mountain 2 miles northwest of Mill Creek and extending northward 0.7 mile to the highway gap at the residence of Lincoln Currence; gentle northwest dip; measured with aneroid, corrected for dip, and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (110'+)			
1. Concealed and shale from top of ridge	20	20	
2. Coal, Gilbert (3205' B.), soft, clean, (2' 9"), Lincoln Currence Prospect (No. 152 on Map II)	3	23	23
3. Concealed and sandstone along ridge, estimated	32	55	
4. Coal blossom, Douglas (3200' B.), farther north on dip	--	55	
5. Sandstone, Lower Dotson, brown	5	60	
6. Concealed, with dark, sandy shale, Douglas Shale	35	95	
7. Coal blossom, Lower Douglas (3180' B.), reported visible when field was plowed	--	95	72
8. Concealed with shale	15	110	
Pottsville Series—New River Group (355')			
9. Sandstone, Nuttall, yellowish-gray, tinged with pink	35	145	50
10. Concealed	20	165	
11. Shale, Upper Iaeger, dark	5	170	
12. Fire clay shale, gray	3	173	
13. Coal, soft --- 1' 6" 14. Shale, dark--10 0 15. Coal -------- 0 10 (12' 4") Hughes Ferry (3065' B.) Lincoln Currence Prospect (No. 177 on Map II)	12	185	40
16. Fire clay shale and concealed	5	190	
17. Sandstone, Harvey, massive at top, shaly at base	29	219	
18. Shale, Sandy Huff, dark	1	220	
19. Coal, soft ----2' 10" 20. Shale, gray --0 1 21. Coal, soft ----0 8 22. Fire clay shale, gray -----3 3 23. Coal, soft ----1 10 24. Bone --------0 11 (9' 7") Castle (3065' B.) Lincoln Currence Prospect (No. 2C7 on Map II)	10	230	45
25. Fire clay shale	5	235	
26. Sandstone, Guyandot, massive, poorly exposed, little shale at base	30	265	
27. Coal, clean, reported 3' 0" 28. Bone, reported 1 0 (4' 0") Sewell "B" (2905' B.) Lincoln Currence Prospect (No. 226 on Map II)	4	269	
29. Concealed	61	330	
30. Shale, black, at old prospect, Sewell Coal horizon	--	330	100
31. Sandstone, Welch, gray, massive, cliff, with numerous small quartz pebbles	35	365	

	Thick-ness. Feet.	Total. Feet.	Inter-vals. Feet.
32. Coal, Welch (2805' B.), Lincoln Currence Prospect (No. 403 on Map II), farther north on dip; reported by owner as 4' 0" at outcrop but as completely disappearing beneath hill	--	365	35
33. Concealed	50	415	
34. Sandstone, Upper Raleigh (Sharon), gray, massive, with large irregular quartz pebbles some of which are 2" or 3" in diameter, partly exposed at Currence residence but entirely visible along mountain farther north	50	465	100
35. Shale, red, Mauch Chunk Series	--	---	

Cromer Top Section.

Huttonsville District; starting at Cromer Top where the Staunton and Parkersburg Pike crosses Cheat Mountain 3 miles northwest of Cheat Bridge and traversing northwestward to Catskill-Chemung contact slightly east of Riffle School; dip southeast about 10°; measured with aneroid, corrected for dip, and arranged in descending stratigraphic order by David B. Reger.

	Thick-ness. Feet.	Total. Feet.	Inter-vals. Feet.
Mauch Chunk Series—Bluestone, Princeton, and Hinton Groups (515'+)			
1. Shale, red, partly concealed	125	125	
2. Sandstone, Fall Mills?, green	15	140	
3. Shale, red, partly concealed	250	390	
4. Sandstone, Upper Bellepoint?, reddish-brown and cross-bedded at top, greenish and massive at base (3475' B.)	70	460	460
5. Shale, red	15	475	
6. Sandstone, Stony Gap, greenish-red, massive	40	515	55
Mauch Chunk Series—Bluefield Group (605')			
7. Shale, red, and concealed	40	555	
8. Sandstone, Graham, (Big Spruce Knob of Webster County Report?), green, flaggy, with 10 feet of limestone conglomerate at base (3385' B.)	30	585	70
9. Shales, Upper and Lower Graham, green and red	50	635	
10. Sandstone, Bertha, red, cross-bedded	20	655	70
11. Shale, red	125	780	
12. Shale, green, sandy	15	795	
13. Concealed and red shale	40	835	
14. Sandstone, Droop, red	20	855	200
15. Shale, Talcott, red	30	885	
16. Shale, Ada, green, calcareous, with marine fossil fragments (3170' B.)	30	915	
17. Shale, red	25	940	
18. Sandstone, flaggy	5	945	
19. Shale, green	15	960	

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
20. Limestone, Reynolds, gray, with marine fossils (3125′ B.); crinoids, brachiopods	25	985	
21. Sandstone, Webster Springs	15	1000	145
22. Concealed	15	1015	
23. Limestone, Glenray, dark, siliceous, with marine fossils (3085′ B.); crinoids	30	1045	
24. Concealed (3025′ B.)	75	1120	120
Greenbrier Series (115′)			
25. Limestone, Alderson, dark, partly weathering yellow, siliceous, with marine fossils (2985′ B.); crinoids and brachiopods	60	1180	
26. Sandstone, Cypress, red, calcareous, with red shale	15	1195	75
27. Limestone, Union, gray, pure, oolitic (2945′ B.)	40	1235	
Pocono Series (40′)			
28. Sandstone, Broad Ford, gray, with quartz pebbles (2920′ B.)	40	1275	80
Catskill Series (760′)			
29. Shale, red and green, to turn of road (2900′ B.) (From this point road follows approximate dip of rocks to head of deep ravine at 2820′ B.)	30	1305	
30. Shale, red and green, with a little sandstone	300	1605	
31. Sandstone, greenish-brown, cross-bedded	40	1645	370
32. Shale, red	5	1650	
33. Sandstone, greenish-brown, shaly, cross-bedded	50	1700	
34. Shale, red	20	1720	
35. Sandstone, reddish-brown, cross-bedded, with a little red shale	40	1760	
36. Shale, red, with a little sandstone	70	1830	
37. Sandstone, greenish-brown, massive	35	1865	220
38. Shale, red, partly concealed, to bridge across Back Fork of Riffle Creek (2580′ B.)	20	1885	
39. Shale, red, and red, cross-bedded sandstone, poorly exposed (2470′ B.)	150	2035	170
Chemung Series (______)			
40. Sandstone, Hendricks, olive-green, hard, not measured	--	---	

Cheat Bridge Section.

Huttonsville District; starting on a spur of Cheat Mountain one mile west of Cheat Bridge and first extending northeastward along strike to the Staunton and Parkersburg Pike at White Top and thence southeastward with this road along rise of rocks to Cheat Bridge; dip northwest; measured principally with hand-level, corrected for dip, and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (403'+)			
1. Concealed from top of point to level of W. Va. Pulp & Paper Co. Core Test No. 3 (No. 52 on Map II) (4268' L.)	28	28	
2. Sandstone, Upper Chilton, partly concealed	17	45	45
3. Concealed	115	160	
4. Sandstone, Monitor?, partly concealed	35	195	150
5. Concealed to level of W. Va. Pulp & Paper Co. Core Test No. 4 (No. 53 on Map II) (4046' L.)	55	250	
6. Concealed to level of W. Va. Pulp & Paper Co. Core Test No. 5 (No. 54 on Map II) (3953' L.)	93	343	
7. Concealed to road at White Top (3948' L.)	5	348	
8. Shale, sand, and concealed	38	386	
9. Coal, Gilbert, W. Va. Pulp & Paper Co. property, old U. S. Army Mine (No. 153 on Map II) (3908' L.); fallen shut, reported 2' 4"	2	388	193
10. Concealed	15	403	
11. Coal prospect, Lower Douglas Coal horizon (3893' L.); little black slate on dump	--	403	15
Pottsville Series—New River Group (284')			
12. Sandstone (4' visible) and concealed, Nuttall Sandstone	44	447	
13. Coal, Hughes Ferry, W. Va. Pulp & Paper Co. Prospect (No. 182 on Map II) (3860' B.); reported as 4' 0" at outcrop but pinched out to 1' 6"	1½	448½	45½
14. Shale, gray and concealed	7½	456	
15. Sandstone, Harvey, massive	48	504	
16. Concealed to level of W. Va. Pulp & Paper Co. Core Test No. 6 (No. 55 on Map II) (3785' B.)	93	597	
17. Sandstone, Lower Guyandot, shaly	9	606	
18. Coal blossom, Sewell (Sharon), W. Va. Pulp & Paper Co. Exposure (No. 323 on Map II) (3779' B.)	1	607	158½
19. Concealed	40	647	
20. Slate, black, streak, Welch Coal horizon	--	647	
21. Sandstone, Upper Raleigh (Sharon), massive, pebbly	40	687	80
Mauch Chunk Series—Bluestone, Princeton, and Hinton Groups (169')			
22. Concealed and sandy shale	50	737	
23. Shale, black, not in place?	--	737	
24. Concealed to Shavers Fork of Cheat River at Cheat Bridge (3535' B.)	119	856	

The following section, just outside the limits of Randolph County, was measured in the season of 1924 in the course of an extended investigation of the Mississippian rocks of the Appalachian States. Since that time the locality has been revisited several times and extensive corrections and additions have been made. A section along the same line of traverse by Paul H. Price has been recently published on pages 116-118 of the Pocahontas Report of the Survey, in which a slightly different interpretation of some of the strata is offered:

Durbin Section.

Greenbank District, Pocahontas County; starting on Back Allegheny Mountain 1.8 miles southeast of Cheat Bridge and 0.5 mile south of the gap which is crossed by the Staunton and Parkersburg Pike and traversing northward to this gap and then southeastward along the pike 0.8 mile to the base of the Alderson Limestone; thence offsetting southward 1.4 miles to another exposure of the Alderson Limestone slightly west of the pike; thence descending eastward to the pike and following the same to the foot of the mountain at Durbin; dip northwest 10° to 15°; measured with aneroid, corrected for dip, and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—New River Group (______)			
1. Sandstone, Upper Raleigh (Sharon), white, quartz pebble conglomerate (4345' B.); thickness not measured	--	---	
Mauch Chunk Series—Bluestone, Princeton, and Hinton Groups (665')			
2. Concealed, with red shale, to pike (3757' L.)	588	588	
3. Concealed, with white sandstone boulders from above	37	625	
4. Sandstone, Stony Gap, greenish-gray, massive, coarse	40	665	665
Mauch Chunk Series—Bluefield Group (420')			
5. Shale, red and green	30	695	
6. Sandstone, Graham, (Big Spruce Knob of Webster County Report?), reddish-brown, massive at base (3640' B.), with plant stems (Lot 422)	65	760	95
7. Shale, red	70	830	
8. Sandstone, Bertha, green, shaly	5	835	75
9. Shale, red and green, partly concealed	100	935	
10. Shale, Ada, green, fissile, fucoidal? (3475' B.)	10	945	
11. Shale, red, partly concealed	75	1020	
12. Sandstone, Webster Springs, red, cross-bedded	20	1040	205
13. Limestone, Glenray, red, with marine fossils; crinoids, etc.	30	1070	
14. Shale, Lillydale, (Menard age), partly dark-green and partly red (3370' B.)	15	1085	45
Greenbrier Series (220')			
15. Limestone, Alderson, (Glen Dean age), dark and siliceous, with marine and			

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
	plant fossils (3365′ B.). **Lot 305** from plant fossils; **Lot 304** from marine fossils; contains abundant brachiopods (**Orthotetes**, etc.), bryozoa, and horn corals (not examined by Tilton). Thence offsetting to a more southern exposure as above noted, where the same limestone is dark, tinged with red, hard and impure, with marine fossils (3450′ B.); crinoids, gastropods, brachiopods, and bryozoa (**Archimedes**), **Lots 303 and 304** (not examined by Tilton)	40	1125	
16.	**Sandstone, Cypress**, red, flaggy	10	1135	50
17.	**Limestone, Union, (Gasper** portion), gray, weathering white, pure, oolitic, with marine fossils (3377′ B.); crinoids, gastropods, blastoids (**Pentremites**), **Lot** 302 (not examined by Tilton)	73	1208	
18.	**Sandstone, Bethel**, red, calcareous	2	1210	75
19.	**Limestone, Union, (Fredonia** portion), greenish-gray, weathering white, oolitic, with marine fossils; crinoids and gastropods	35	1245	
20.	Concealed	50	1295	
21.	**Limestone, Patton**, greenish-gray, earthy, with marine fossils (3290′ B.); crinoids and blastoids (**Pentremites**)	10	1305	95
Maccrady Series (80′)				
22.	Limestone, red, very sandy	10	1315	
23.	Shale, red and yellow, partly concealed (3220′ B.)	70	1385	
Pocono Series (120′)				
24.	Concealed, with sandstone	80	1465	
25.	**Sandstone, Berea**, gray, with quartz pebbles (2130′ B.), poorly exposed	40	1505	
Catskill Series (630′)				
26.	Shale, red	30	1535	
27.	Sandstone, green, cross-bedded	20	1555	
28.	Shale, red; fish plate in green streak at top (**Lot 446**)	25	1580	
29.	Sandstone, green, cross-bedded, with fossil tree trunks and foliage of **Archaeopteris, (Lot 451)**	25	1605	300
30.	Shale, red	30	1635	
31.	Sandstone, reddish-brown, cross-bedded	30	1665	
32.	Shale, red, with sandstone	50	1715	
33.	Sandstone, red and green, cross-bedded	50	1765	
34.	Shale, red	20	1785	
35.	Sandstone, green, cross-bedded	30	1815	
36.	Shale, red, with sandstone	50	1865	
37.	Sandstone, green, coarse, cross-bedded	40	1905	
38.	Shale, red	10	1915	

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
39. Sandstone, green, tinged with red, with fossil tree trunk roots and foliage of Archaeopteris and Dimeripteris in green shale at base (Lot 428)	30	1945	340
40. Concealed, with red shale	100	2045	
41. Sandstone, green, tinged with red, cross-bedded and broken by red and green shale, with plant fragments, Dimeripteris (Lot 427)	40	2085	140
42. Concealed, with sandstone, in bed of Greenbrier River	25	2110	
43. Sandstone, reddish-brown, with red and green shale, in Western Maryland Railway cut	15	2125	
44. Sandstone, green, medium-coarse, in railway cut	10	2135	50
Chemung Series (______)			
45. Sandstone, Hendricks, green, flaggy, with marine fossils (2730′ B.); crinoids and brachiopods (Camarotoechia?); exposed just east of railway	--	---	

MEASURED SECTIONS, MINGO DISTRICT.

Mingo District occupies the extreme southern end of the county next to Pocahontas and Webster, including portions of the drainage of Shavers Fork of Cheat, Tygart, Elk, and Gauley Rivers. Its surface rocks include the lower portion of the Pennsylvanian, the entire Mississippian, and the upper portion of the Devonian, and numerous exposures are available where the strata may be measured to good advantage. The three following sections are mostly within the drainage of Tygart River and principally illustrate the nature of the Mississippian and upper part of the Devonian as they occur near the southern end of the Deer Park Anticline:

Valley Head Section.

Mingo District; starting at a high knob on the eastern end of Point Mountain 2.8 miles northwest of Monterville and thence descending southward to State Road No. 15 and thence eastward and southeastward with the new grade of this road via Monterville to Ralston Run, and thence eastward with this run and across Tygart River to the eastern edge of Valley Head; dip northwest, being gentle in upper portion but increasing toward base; measured partly with aneroid and partly by pacing and vertical angles, corrected for dip, and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (205′+)			
1. Sandstone and concealed	55	55	
2. Sandstone, Decota?, white, massive, coarse, pebbly	50	105	105

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
3. Concealed	84	189	
4. Sandstone, Lower Dotson, massive	15	204	
5. Coal, Lower Douglas (1' 3") (3810' B.), (Exposure No. 160 on Map II)	1	205	100
Pottsville Series—New River Group (356')			
6. Concealed with shale and a little sandstone	70	275	
7. Coal blossom, Iaeger "B" (3755' B.)	--	275	
8. Shale, sandy	5	280	
9. Sandstone, Lower Nuttall, massive	25	305	
10. Concealed, with shale, Upper Iaeger	20	325	
11. Coal blossom, Hughes Ferry (3715' B.)	--	325	120
12. Shale, sandy, partly concealed	40	365	
13. Sandstone, Harvey, massive, cliff	45	410	
14. Coal, Castle, (3' 0") good, hard, columnar; Davis and Elkins land, Geo. B. Swecker Mine (No. 212 on Map II) (3640' B.)	3	413	88
15. Shale, Skelt	30	443	
16. Coal blossom, Sewell "B" (3620' B.); 2' 8" visible, but reported 2' 10" by Swecker; Davis and Elkins land (No. 229 on Map II)	3	446	
17. Shale, Hartridge, sandy, partly concealed, with plant fossils at base (Lot 408)	20	466	
18. Coal, good, soft, columnar --3' 6" / 19. Coal, and slate, bony ------1 5 } (4' 11") Sewell (3600' B.) Davis & Elkins land, George B. Swecker Mine (No. 333 on Map II)	5	471	58
20. Shale	39	510	
21. Coal, Welch (3565' B.), Davis and Elkins Exposure (No. 407 on Map II)	1	511	
22. Shale and concealed	25	536	
23. Sandstone, Upper Raleigh (Sharon), gray, massive	20	556	
24. Shale, sandy	5	561	
25. Coal blossom, Fire Creek (3530' B.)	--	561	90
Mauch Chunk Series—Bluestone Group (5')			
26. Shale, red	5	566	
Mauch Chunk Series—Princeton Conglomerate (15')			
27. Sandstone, Princeton, green, massive, coarse (3515' B.)	15	581	20
Mauch Chunk Series—Hinton Group (288')			
28. Concealed	5	586	
29. Coal, Pluto, streak (3510' B.)	--	586	
30. Fire clay, white	3	589	
31. Limestone, Pluto, mostly red shale with limestone boulders	22	611	
32. Limestone, Pluto, hard, siliceous	1	612	
33. Sandstone, Falls Mills, shaly	2	614	33
34. Shale, red	30	644	
35. Sandstone, Tallery, green, shaly	15	659	
36. Shale, red	10	669	
37. Sandstone, Avis, green, shaly	5	674	60

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
38. Shale, red	35	709	
39. Sandstone, Goodwyn, green	5	714	
40. Shale, red, partly concealed	125	839	
41. Sandstone, Stony Gap, green, partly shaly and partly massive (3300' B.)	30	869	195
Mauch Chunk Series—Bluefield Group (445')			
42. Shale, Coney, red, to Pickens road fork in low gap. Sample No. 693R, land of Davis and Elkins	40	909	
43. Shale, red	60	969	
44. Sandstone, red, flaggy	25	994	
45. Shale, red	30	1024	
46. Sandstone, Bradshaw?, red, shaly	15	1039	
47. Shale, red, partly concealed	100	1139	
48. Sandstone, Droop, greenish-gray, weathering white and soft (3150' B.)	15	1154	285
49. Shale, Ada, green, fissile, with streaks of limestone which contain numerous marine fossils; brachiopods (Spirifer pellaensis, etc.)	35	1189	
50. Limestone, Reynolds, dark-gray, weathering yellow, shaly, with abundant marine fossils (3110' B.). Lot 378; contains crinoid stems, Orthotetes kaskaskiensis, Productus ovatus, Diaphragmus elegans, Spirifer pellaensis, Composita trinuclea, Composita subquadrata, Straparollus planidorsatus, Myalina sp., according to Tilton	25	1214	
51. Shale, green, sandy	5	1219	
52. Limestone, dark, sandy, tinged with red	5	1224	
53. Shale, Bickett, red, sandy	30	1254	
54. Sandstone, Webster Springs, greenish-gray, thick-bedded, poorly exposed (3145' B.); contains plant stems, Lot 452, in old road farther north	60	1314	160
Greenbrier Series (286')			
55. Limestone, Alderson, dark, impure, shaly (3020' B.), with abundant marine fossils. Lot 377; contains Zaphrentis spinulosa, Orthotetes kaskaskiensis, Productus ovatus, Diaphragmus elegans, Echinochonchus alternatus, Spirifer pellaensis, Cliothyridina sublamellosa, Composita trinuclea, Straparollus sp., Psammodus sp., according to Tilton	40	1354	
(Thence offsetting to base of same horizon ¼ mile farther south):			
56. Limestone, Union, (Gasper portion), white, oolitic	65	1419	
57. Limestone, Union, (Bethel Sandstone stage), red shale	20	1439	

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
58. **Limestone, Union, (Fredonia** portion), mostly gray, pure and oolitic, but partly siliceous and cross-bedded	40	1479	
59. **Limestone, Pickaway,** dark, impure and sandy, shows stylolitic structure in big sink near Monterville	20	1499	
60. **Shale, Upper Taggard,** red	3	1502	
61. **Limestone, Taggard,** red, oolitic	3	1505	191
62. **Shale, Lower Taggard,** red, calcareous	5	1510	
63. **Limestone, Patton,** dark-gray, slightly siliceous, with oolite	65	1575	
64. **Sandstone, Patton Shale** horizon, greenish-brown, flaggy, best exposed in big sink near Monterville	5	1580	
65. **Limestone, Sinks Grove,** mostly dark and siliceous (2935′ B.)	20	1600	95
Pocono Series (50′)			
66. **Sandstone, Broad Ford,** partly greenish-gray and partly reddish-brown, with some flat, elongated quartz pebbles and with numerous marine fossils; brachiopods (**Syringothyris?** or **Spirifer?, Orthotetes**), crinoids	50	1650	50
Catskill Series (635′)			
67. Shale, dark-green (2895′ B.), with plant fossils, **Archaeopteris hybernica?** (2895′ B.) **(Lot 409)**	15	1665	
68. Shale, red	15	1680	
69. Sandstone, reddish-green	10	1690	
70. Shale, red	25	1715	
71. Sandstone, reddish-brown, massive, with plant stems	30	1745	
72. **Shale, Saxton,** pale-green, with a few plant leaves (2830′ B.)	10	1755	105
73. Shale, red, green, and variegated with a little sandstone (2690′ B.), and with plant fossils **(Dimeripteris)** near base **(Lot 410). Sample No. 690R,** land of Isaac Painter	180	1935	
74. Sandstone, partly reddish-brown and partly greenish-brown, mostly massive	80	2015	260
75. Shale, red, green, and variegated, partly concealed, with abundant plant fossils **(Dimeripteris)** near top **(Lot 439)**	100	2115	
76. Sandstone, greenish-brown, shaly	10	2125	
77. Shale, red	15	2140	
78. Sandstone, reddish-brown	15	2155	
79. Shale, red, with a little sandstone, to bridge across Ralston Run at foot of mountain	50	2205	
80. Sandstone, greenish-gray, coarse, cross-bedded	50	2255	

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
81. Shale, red, concealed, and reddish-brown, cross-bedded sandstone (2455′ B.)	30	2285	270
Chemung Series (525′+)			
82. **Sandstone, Hendricks,** greenish-brown, with marine fossils; long pelecypods, also brachiopods	25	2310	
83. Shale, olive-green, with a few marine fossils and also a plant fossil zone	20	2330	
84. Sandstone and shales, alternating, poorly exposed and not examined in detail along distance of 0.7 mile, computed from average dip	380	2710	425
85. **Sandstone, Valley Head** (type locality), partly greenish-brown and partly reddish-brown, thick-bedded with streaks of shale between, partly ripple-marked and having occasional small white quartz pebbles; exposed partly at west end of Tygart River bridge, partly in bluff east of school south of village, partly in sharp ridge north of village and partly along road north of church and northeast of village; contains a few marine fossils and has large trees at exposure near church, one being 4′ 0″ in diameter. **Lot 374** of fossil trees. Estimated thickness	100	2810	

Snyder Knob Section.

Mingo District, starting at the top of Snyder Knob of Cheat Mountain and extending northwestward to the head of Conley Run of Tygart River 2.7 miles east of Valley Head; gentle southeast dip; measured with aneroid, corrected for dip, and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—New River Group (120′+)			
1. **Sandstone, Guyandot,** white, massive, partly concealed	65	65	65
2. Concealed	15	80	
3. **Sandstone, Upper Raleigh (Sharon),** white, pebbly, cliff (4505′ B.)	40	120	55
Mauch Chunk Series—Bluestone, Princeton, and Hinton Groups (625′)			
4. Concealed	145	265	
5. Shale, red	300	565	
6. **Sandstone, Upper Bellepoint,** greenish-brown, medium-coarse, flaggy, makes cliff (4100′ B.)	25	590	470
7. Shale, red, partly concealed	125	715	
8. **Sandstone, Stony Gap,** reddish-brown, thick-bedded, hard, medium-coarse,			

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
makes rock castle on high point (3975' B.)	30	745	155
Mauch Chunk Series—Bluefield Group (620')			
9. Shale, red, partly concealed	295	1040	
10. **Sandstone, Indian Mills,** reddish-brown, flaggy	15	1055	310
11. Concealed, mostly red shale, to high gap one mile west of Snyder Knob; topography rounded and worn, with evidence of peneplanation (3700' B.)	15	1070	
12. **Sandstone, Droop,** reddish-brown, flaggy	35	1105	50
13. **Shales, Ada and Bickett,** red	50	1155	
14. **Sandstone, Webster Springs,** green, flaggy, hard, medium-coarse; makes shoulder beneath wide flat	15	1170	65
15. Concealed, with a little red shale, horizon of **Glenray Limestone** and **Lillydale Shale**	160	1330	
16. **Sandstone, Edray,** green, thick-bedded, hard, poorly exposed, may have some shale below it (3460' B.)	35	1365	195
Greenbrier Series (407')			
17. **Limestone, Alderson,** dark, weathering yellow, impure, with fairly numerous marine fossil fragments, brachiopods (**Spirifer,** etc.)	85	1450	
18. **Limestone, Union, (Gasper** portion), gray, weathering white, oolitic, pure, with a few marine fossils (3325' B.); cup corals. **Sample No. 682R,** land of **Woodford Hutton**	80	1530	
19. **Limestone, Union, (Fredonia** portion), gray, slightly sandy, mostly oolitic, with a few marine fossil fragments	65	1595	230
20. Limestone, red, sandy, impure and shaly	2	1597	
21. **Limestone, Pickaway, Patton,** and **Sinks Grove,** gray, sandy, hard, partly oolitic	175	1772	177
Maccrady Series (20')			
22. **Limestone, Warsaw,** yellow, impure, poorly exposed (3105' B.)	20	1792	
Pocono Series (120')			
23. **Sandstone, Broad Ford,** greenish-brown, thick-bedded with streaks of quartz pebble conglomerate and a little limestone conglomerate, and with abundant marine fossils (3010' B.); brachiopods (**Syringothyris**), large and numerous	120	1912	
Catskill Series (______)			
24. Red shales and sandstones, not measured	--	---	

Mingo Section.

Greenbank District, Pocahontas County, and **Mingo District, Randolph County,** starting at the top of Mace Knob of Cheat Mountain and extending northwestward 1.1 miles to the State road at Mace, including exposures both east and west of road; thence northwestward with the road 0.8 mile to an old church; thence offsetting 0.7 mile westward to a private road just southwest of Fairview School where the Maccrady is visible; thence offsetting 0.8 mile northward to the Confederate monument and traversing northward down the mountain road to the bridge across Tygart River at Upper Mingo; dips partly eastward and partly westward due to crossing of Deer Park Anticline but too gentle to need correction; measured with aneroid and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—New River Group (270'+)			
1. Concealed and coarse sandstone from top of Mace Knob	60	60	
2. Concealed	100	160	
3. Concealed, with pebbly sandstone boulders	50	210	
4. **Sandstone, Upper Raleigh (Sharon),** white, massive, with large white, angular quartz pebbles (4435' B.)	60	270	270
Mauch Chunk Series—Bluestone Group (170')			
5. Concealed, red shale?	85	355	
6. Shale, red, along slope	65	420	
7. Shale, red, and concealed, along bench (4265' B.)	20	440	
Mauch Chunk Series—Princeton Conglomerate (80')			
8. **Sandstone, Princeton,** greenish-gray, massive, coarse; makes topographic shoulder (4185' B.)	80	520	250
Mauch Chunk Series—Hinton Group (320')			
9. **Shale,** red, partly concealed	150	670	
10. Steep bluff, with red shale and red sandstone	35	705	
11. Concealed and red shale in bench	20	725	
12. Steep bluff, with sandstone and red shale	60	785	
13. Concealed, with red shale	40	825	
14. **Sandstone, Stony Gap,** greenish-brown, partly massive, hard (3865' B.)	15	840	320
Mauch Chunk Series—Bluefield Group (435')			
15. **Shale, Coney,** red	55	895	
16. **Sandstone, Clayton,** red, flaggy (3795' B.); makes cliff and shoulder	15	910	
17. **Shale, Clayton,** red	30	940	
18. **Sandstone, Graham,** red, flaggy	10	950	110
19. Shale, red	40	990	
20. **Sandstone, Bradshaw,** red, flaggy	15	1005	55
21. Shale, red, to grade of Western Maryland Railway (3670' B.)	30	1035	
22. Shale, red, with a little red sandstone (3610' B.)	60	1095	

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
(Thence offsetting to top of ridge just west of Mace):			
23. Concealed, mostly, with partly rounded and weathered boulders at top (peneplain material) and with shale and flaggy sandstone lower down	60	1155	
24. **Limestone, Reynolds**, shaly, with marine fossils; brachiopods (abundant **Orthotetes, Spirifer pellaensis, Composita**)	25	1180	175
25. Shale, green, sandy	3	1183	
26. **Limestone, Reynolds**, dark, shaly, with marine fossils; abundant gastropods, also brachiopods (**Spirifer pellaensis**, etc.)	2	1185	
27. Shale, green, calcareous, with marine fossils; pelecypods	20	1205	
28. **Shale, Bickett**, red, to road summit at Mace (3485′ B.)	15	1220	
(Thence northwestward with State road):			
29. **Limestone, Glenray**, impure, shaly, and siliceous	10	1230	50
30. **Shale, Lillydale**, (upper bench), dark-green, with carbonaceous streak at top (3470′ B.) **Sample No. 686R**, land of **F. P. Marshall Heirs**	5	1235	
31. **Sandstone, Edray**, mostly green, flaggy, and shaly, but partly red (U. S. B. M. 3464′ is 4 feet below top)	30	1265	
32. **Shale, Lillydale**, (lower bench), dark-green, fissile	5	1270	
33. Sandstone, greenish-red, calcareous (3430′ B.)	5	1275	45
Greenbrier Series (330′)			
34. **Limestone, Alderson**, dark, weathering yellow, shaly, and impure	15	1290	
35. **Limestone, Alderson**, dark-gray, granular, with sandy layer at top, and with marine fossils; crinoids (**Pterotocrinus**)	15	1305	
36. **Limestone, Alderson**, dark, weathering yellow, shaly, with marine fossils; crinoids and brachiopods	5	1310	
37. **Sandstone, Cypress**, shaly	5	1315	40
38. **Limestone, Union**, (**Gasper** portion), shaly, with marine fossils; brachiopods	10	1325	
39. **Limestone, Union**, (**Gasper** portion), dark-gray, siliceous, oolitic	15	1340	
40. **Limestone, Union**, (**Fredonia** portion), dove-colored, weathering white, pure, with marine fossils (3340′ B.); abundant crinoids. **Sample No. 687R**, land of **F. P. Marshall Heirs**	25	1365	50
41. Sandstone, green, flaggy, calcareous	5	1370	
42. **Limestone, Pickaway**, mostly dark and			

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
weathering yellow, but partly tinged with pink; a little oolite near base; mostly stylolitic. Contains marine fossils; abundant crinoids and a few brachiopods	75	1445	
43. Shale, Upper Taggard, red and green	10	1455	
44. Limestone, Taggard, grayish-pink, oolitic, fragments	--	1455	90
45. Shale, Lower Taggard, red, with a little red limestone	15	1470	
46. Limestone, Patton, mostly dark-gray, but partly tinged with red, partly oolitic, but mostly sandy and impure, hard, stylolitic at top; quarried for road metal. Sample No. 688R, land of F. P. Marshall Heirs	63	1533	
47. Shale, Patton, red, at ravine (3170′ B.)	2	1535	
48. Limestone, Sinks Grove, gray, hard, oolitic. Sample No. 689R, land of F. P. Marshall Heirs	20	1555	
49. Limestone, Sinks Grove, impure and sandy, tinged with red	5	1560	
50. Limestone, Sinks Grove, dark, weathering yellow, hard, amorphous, with marine fossils (3100′ B.); brachiopods (Orthotetes?, Productus, Diaphragmus, Spirifer pellaensis?), fenestelloids; exposed just south of old church	45	1605	150
(Thence offsetting to private road just southwest of Fairview School):			
Maccrady Series (15′)			
51. Limestone, Warsaw, yellow, impure, sandy, with streaks of purplish-red shale	5	1610	
52. Soil, yellow; bedded rocks not exposed	10	1620	
(Thence offsetting northward to Confederate monument near north edge of plateau):			
Pocono Series (220′)			
53. Sandstone, Broad Ford, greenish-brown, thick-bedded, fine-grained, hard, irregular weathering; same ledge near Fairview School contains some red hematite and a marine fossil zone 10′ below top, with brachiopods (Camarotoechia and Chonetes)	90	1710	
54. Sandstone, Broad Ford, zone of green, sandy shale with marine fossils; brachiopods (found one large ribbed Chonetes)	25	1735	
55. Sandstone, Broad Ford, greenish-brown, thick-bedded, fine-grained, hard, with streaks of shale (2875′ B.); zone of abundant marine fossils at elevation 2910′, or 10′ below top; brachiopods			

		Thick-ness. Feet.	Total. Feet.	Inter-vals. Feet.
	(Syringothyris, Spirifer?, Orthotetes), and pelecypods	45	1780	175
56.	**Shale, Sunbury,** black, fissile	10	1790	
57.	Concealed	10	1800	
58.	Sandstone, green	5	1805	
59.	**Shale, Sunbury,** dark-green, sandy, with marine fossils (2845′ B.); brachiopods **(Lingula),** ostracods and other small bivalves and fish teeth?	5	1810	
60.	**Sandstone, Berea,** greenish-gray, massive, with plant stems	9	1819	
61.	Shale, gray, sandy, with plant roots	1	1820	
62.	**Sandstone, Berea,** greenish-gray, massive, hard	15	1835	55
63.	Shale, greenish-gray, sandy (2815′ B.)	5	1840	
Catskill Series (140′+)				
64.	Shale, red, and reddish-brown sandstone	10	1850	
65.	Concealed, mostly sandy shale	35	1885	
66.	Sandstone, green, shaly	10	1895	
67.	**Shale, Saxton,** pale-green, but red toward top, argillaceous, chunky, with marine and plant fossils (2735′ B.). **Lot 376;** contains pelecypods, fish remains, and plants **(Dimeripteris** and **Archaeopteris?)**	25	1920	85
68.	Concealed, with sandstone and red shale	35	1955	
69.	Sandstone, red, shaly, and crumbly, makes cliff at bridge	15	1970	
70.	Shale, red, to Tygart River at bridge just north of Upper Mingo (2675′ B.)	10	1980	

The following section shows the surface outcrops near the southern end of the North Potomac (Georges Creek) Basin:

Hopkins Section.

Mingo District; starting on a spur of Cheat Mountain 0.9 mile west of Hopkins and extending eastward to Shavers Fork of Cheat River at Hopkins; strata approximately level; measured with aneroid and arranged in descending stratigraphic order by David B. Reger.

		Thick-ness. Feet.	Total. Feet.	Inter-vals. Feet.
Pottsville Series—Kanawha Group (215′+)				
1.	Concealed from top of ridge	150	150	
2.	**Sandstone, Lower Gilbert,** shaly	10	160	
3.	Concealed and slate	3	163	

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
4.	Coal, hard, bony ---0' 10"			
5.	Slate, dark --------0 6			
6.	Coal --------------0 2			
7.	Slate, dark --------0 6			
8.	Bone --------------0 4			
9.	Coal, soft ---------0 9			
10.	Bone --------------0 3			
11.	Coal --------------0 3			
12.	Bone --------------0 1			
13.	Coal, medium-soft --3 3			
14.	Coal, slightly bony--0 2			
4.–14.	(7' 1") Gilbert (4400' B.) W. Va. Pulp & Paper Co. Mine (No. 154 on Map II)	7	170	170
15.	Concealed	45	215	
Pottsville Series—New River Group (270')				
16.	Concealed in steep bluff	105	320	
17.	Concealed to bench, Sewell Coal horizon (4200' B.)	50	370	200
18.	Concealed and sandstone, Upper Raleigh (Sharon), in steep bluff (4085' B.)	115	485	115
Mauch Chunk Series—Bluestone, Princeton and Hinton Groups (415'+)				
19.	Concealed and red shale to railroad grade	400	885	
20.	Concealed to Shavers Fork of Cheat River at Hopkins (3670' B.)	15	900	

In the valley of Elk River, including not only the southern end of Randolph County which extends across it but the adjacent portions of Webster and Pocahontas as well, there are many good opportunities to measure the strata, on account of the depth to which erosion has advanced. The following section was measured at Webster Springs, Webster County, and represents a much farther advanced stage of knowledge, especially of the Mississippian, than was the case when the Report of the writer on that county was published in 1920:

Webster Springs Section.

Fork Lick District, Webster County; starting at the top of the mountain 2 miles due north of Webster Springs, extending westward to the State road at the schoolhouse gap at the head of Right Fork of Grassy Creek and thence southward with the State road to Webster Springs; dip northwest about 300 feet per mile; measured with aneroid, corrected for dip, and arranged in descending stratigraphic order by David B. Reger.

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (491'+)				
1.	Interval along approximate strike from top of knob to schoolhouse at road fork (2333' L.); not examined	367	367	
2.	Concealed	80	447	
3.	Coal, Douglas?, 0' 1" visible (2280' B.)	--	447	447
4.	Shale, sandy	44	491	

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—New River Group (267')				
5.	Sandstone, Nuttall, gray, massive	65	556	
6.	Concealed	35	591	
7.	Coal blossom, Hughes Ferry (2175' B.)	--	591	144
8.	Fire clay and sandy shale	27	618	
9.	Coal blossom, Lower Iaeger (2155' B.)	1	619	
10.	Fire clay shale	7	626	
11.	Sandstone, Harvey, shaly	18	644	
12.	Coal, Castle (1' 10"), good, soft (2135' B.)	2	646	55
13.	Fire clay shale, with plant roots	7	653	
14.	Shale, sandy	14	667	
15.	Sandstone, Guyandot, gray, massive	14	681	
16.	Coal streak, Sewell "B" (2110' B.)	--	681	
17.	Shale, sandy, with a little sandstone	14	695	
18.	Shale, Hartridge, dark, sandy	4	699	
19. 20. 21.	Coal, soft --1' 5" Coal, bony -0 4 Coal, soft --1 4 } (3' 1") Sewell (2165' B.) Miller & Gregory Mine on C. P. Dorr land east of State road; outcrop in road is elevation 2095' B.	3	702	56
22.	Fire clay shale, gray	7	709	
23.	Sandstone, shaly, and sandy shale, Welch Sandstone	34	743	
24.	Coal blossom, Welch (2065' B.)	1	744	42
25.	Fire clay shale, sandy	14	758	
Mauch Chunk Series—Bluestone Group (77')				
26.	Shale, red and green	21	779	
27.	Sandstone, Glady Fork?, massive	7	786	
28.	Shale, red and green	49	835	
Mauch Chunk Series—Princeton Conglomerate (28')				
29.	Sandstone, Princeton, green, fine-grained, thick-bedded or flaggy (1980' B.)	28	863	119
Mauch Chunk Series—Hinton Group (182')				
30.	Shale, Pluto, dark, slightly carbonaceous	21	884	
31.	Shale, green, sandy	21	905	
32.	Shale, red	21	926	
33.	Shale, green, sandy	42	968	
34.	Coal (0' 1"), Goodwyn?, streak (1905' B.)	--	968	105
35.	Shale, Bellepoint?, red and green	35	1003	
36.	Sandstone, Stony Gap, greenish-gray, massive, hard, manganitic, with abundant quartz pebbles, with streak of limestone or shale conglomerate near middle, and with plant stems (1850' B.)	42	1045	77
Mauch Chunk Series—Bluefield Group (593'+)				
37. 38.	Shale, green, with a few plant fragments 2' Shale, red 33 } Coney	35	1080	
39.	Sandstone, Clayton, red, partly massive and partly shaly	14	1094	
40.	Shale, Clayton, red, partly concealed	70	1164	

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
41.	Sandstone, Graham, greenish-red, partly massive and partly shaly, with abundant limestone and shale conglomerate at base (1735′ B.)	42	1206	161
42.	Shale, red	22	1228	
43.	Sandstone, Bertha, red, blocky	7	1235	
44.	Shale, red and green	65	1300	
45.	Sandstone, Bradshaw?, greenish-red, blocky (1665′ B.)	7	1307	
46.	Shale, red, and concealed (river-terrace boulders at 1575′ B.)	236	1543	
47.	Sandstone, Webster Springs, greenish-gray, hard	35	1578	372
48.	Shale, red and green	5	1583	
49.	Shale, green, calcareous, Glenray Limestone horizon, to road at Back Fork bridge, with abundant marine fossils. Lot 455; contains impressions of plant stems, crinoid stems, branching bryozoa, Stenopora sp., Archimedes sp., Orthotetes kaskaskiensis (numerous), Productus?, Diaphragmus elegans, Spirifer pellaensis, Straparollus planidorsatus (indistinct), according to Tilton	10	1593	
50.	Concealed	15	1608	
51.	Limestone, Glenray, (continued), visible in Back Fork of Elk River, but south of Webster Springs on the main Elk the total thickness of Glenray is 50 feet, making this portion	25	1633	
52.	Sandstone, Edray, flaggy, entirely concealed on Back Fork but visible on main Elk	5	1638	60
	Addition for dip is 40 per cent. of original measurement = 350 feet.			

The two following sections are in Randolph County, although previously published in the Webster County Report, pages 103 and 104. Some revisions and corrections to suit more advanced knowledge of the rocks and to harmonize coal prospect numbers with those used on Map II of the present Report have been made:

Whitaker Falls Section.

Mingo District; starting on a spur of Gauley Mountain 1.2 miles southeast of Whitaker Falls and extending northwestward to Elk River at Whitaker Falls; gentle northwest dip; measured with aneroid and arranged in descending stratigraphic order by David B. Reger, without correction for dip, the intervals being slightly excessive.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—New River Group (675')			
1. **Sandstone, Upper Nuttall**, massive, with small quartz pebbles, caps knob	50	50	
2. Concealed in slope	100	150	
3. **Sandstone, Lower Nuttall**, in steep bank, partly concealed	100	250	250
4. Concealed in bench	50	300	
5. **Sandstone, Harvey**	30	330	
6. Concealed, with sandy shale	87	417	
7. **Sandstone, Lower Guyandot**, massive, with small quartz pebbles	65	482	
8. **Shale, Hartridge**, sandy, with ferruginous nodules	3	485	
9. **Coal, Sewell (Sharon)** (4' 8"), W. Va. Pulp & Paper Co. Prospect (**No. 340 on Map II**) (3485' B.)	5	490	240
10. Concealed	15	505	
11. **Sandstone, Welch**, massive	50	555	
12. Concealed in bench	20	575	
13. **Sandstone, Upper Raleigh (Sharon)**, massive, coarse, great ledge (3300' B.)	100	675	185
Mauch Chunk Series—Bluestone, Princeton and Hinton Groups (470')			
14. Shale, red, partly concealed	435	1110	
15. **Sandstone, Stony Gap**, flaggy, cliff rock (2830' B.)	35	1145	470
Mauch Chunk Series—Bluefield Group (675')			
16. Shale, red, partly concealed	255	1400	
17. **Sandstone, Graham, (Big Spruce Knob** of Webster Report)	25	1425	280
18. Shale, red, partly concealed	315	1740	
19. Sandstone, massive ... 50'; 20. Sandstone, in upper falls ... 15; 21. Sandstone, in lower falls ... 15 — **Webster Springs Sandstone** (2155' B.)	80	1820	395
Greenbrier Series (______)			
22. **Limestone, Alderson**, dark, hard, with marine fossils; cup corals, crinoids (**Pterotocrinus?**), brachiopod fragments; also some impressions which slightly resemble the tracks of vertebrates but which may be water pits (visible in river at Samp one-half mile west of falls); this member visible only in river, thickness not exposed	--	1820	

Elk Mountain Section.

Mingo District; starting at the top of Rocky Knob of Elk Mountain 2.3 miles southeast of the mouth of Valley Fork of Elk River and 1.7 miles southwest of Blue Spring and extending northwestward to

Folks' Store 0.3 mile above Valley Fork; measured with aneroid and arranged in descending stratigraphic order by David B. Reger; intervals not corrected for northwest dip and hence total is about 500 feet greater than true vertical measurement would show.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—New River Group (460'+)			
1. Sandstone, Lower Nuttall, massive, with small pebbles, capping Rocky Knob	35	35	
2. Concealed in slope	110	145	
3. Steep bank, with sandstone	55	200	
4. Spring, Castle Coal horizon	--	200	200
5. Concealed in slope	80	280	
6. Shale, Hartridge, sandy	28	308	
7. Coal, (2' 0"), Sewell (4010' B.), soft, (W. Va. Pulp & Paper Co. Prospect No. 341 on Map II)	2	310	110
8. Concealed in slope	50	360	
9. Sandstone, Upper Raleigh (Sharon), massive, cliff	100	460	
Mauch Chunk Series—Bluestone Group (150')			
10. Concealed	150	610	
Mauch Chunk Series—Princeton Conglomerate (25')			
11. Sandstone, Princeton, greenish-gray	25	635	325
Mauch Chunk Series—Hinton and Bluefield Groups (1435')			
12. Concealed	65	700	65
13. Coal streak, Pluto (3660' B.); thickness concealed (W. Va. Pulp & Paper Co. Exposure)	--	700	
14. Concealed, with red shale	1200	1900	
15. Limestone, Reynolds, dark, partly shaly and partly massive, with abundant marine fossils; Spirifer pellaensis, Orthotetes, Composita, Productus, etc.	30	1930	1230
16. Concealed	60	1990	
17. Sandstone, shaly	20	2010	
18. Shale, Bickett, red and calcareous	30	2040	
19. Sandstone, Webster Springs, massive; top portion makes cliff	30	2070	140
Greenbrier Series (______)			
20. Limestone, Alderson, dark, weathering yellow, hard, fucoidal, visible in dry bed of Elk River (2290' B.)	--	2070	

The following section, located in the edge of Pocahontas County, was measured by the writer in 1917 and was published in 1929 by Paul H. Price in the Pocahontas County Report of the Survey, page 100. It gives the full thickness of the Mauch Chunk Series, although lacking many details which would be of much interest if available:

Slaty Fork Section.

Edray District, Pocahontas County; starting at the top of Gauley Mountain 2.8 miles southwest of Slaty Fork and extending northwestward down Flat Ridge of this mountain to Slaty Fork village; gentle northwest dip; measured with aneroid along strike by David B. Reger and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—New River Group (500'+)			
1. Interval from top of mountain; sandstone, concealed, shale, etc., not examined	312	312	
2. Slate, black, thickness not recorded	--	312	
3. Coal, medium-soft 5' 1"; 4. Concealed, with streaks of coal reported 7 0; 5. Coal 1 0 — (13' 1") Sewell (Sharon) (4225' B.) Cherry River Boom & Lumber Co. Prospect (No. 342 on Map II)	13	325	325
6. Concealed	125	450	
7. Sandstone, Upper Raleigh (Sharon); visible near old trail at head of Laurel Run (4050' B.)	50	500	175
Mauch Chunk Series—Bluestone Group (100')			
8. Shale, red, partly concealed	100	600	
Mauch Chunk Series—Princeton Conglomerate (50')			
9. Sandstone, Princeton, massive, pebbly, great conglomerate (3900' B.)	50	650	150
Mauch Chunk Series—Hinton Group (415')			
10. Concealed	90	740	
11. Shale, red, partly concealed	275	1015	
12. Sandstone, Stony Gap, brown, massive, medium-coarse, cliff; makes Nutter Flat (3485' B.)	50	1065	415
Mauch Chunk Series—Bluefield Group (825')			
13. Concealed, with sandstone, in steep bluff	153	1218	
14. Sandstone, flaggy	2	1220	
15. Concealed, mostly red shale	180	1400	
16. Sandstone, Graham (Big Spruce Knob of Webster Report?) (3120' B.)	30	1430	365
17. Concealed	410	1840	
18. Sandstone, Edray, shaly, reported at railroad north of Elk River by Paul H Price	40	1880	450
Greenbrier Series (10'+)			
19. Limestone, to Elk River at Slaty Fork (2660' B.)	10	1890	

The following section, previously published in the Webster Report, page 107, is located in the edge of Webster County just west of that portion of Randolph making a long tongue southward into the drainage of Gauley River on the headwaters of which little attempt has yet been made to prospect the coals. When measuring the section, however, the writer was able to find the horizon of the Sewell Coal although unable to complete a full prospect in the time that was available:

Three Forks of Gauley Section.

Fork Lick District, Webster County; starting on high mountain point one mile northeastward from Three Forks of Gauley and extending southwestward along Webster-Randolph County line to Gauley River at Three Forks; measured with aneroid and arranged in descending stratigraphic order by David B. Reger along strike of rocks; Prospect No. 339 is incomplete and may not represent full thickness of Sewell Coal.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (200'+)			
1. Sandstone, Lower Gilbert, massive, with small pebbles, capping knob	50	50	
2. Concealed	50	100	
3. Spring, with coal blossom, Gilbert (3660' B.)	--	100	100
4. Concealed	30	130	
5. Sandstone, Dotson, and concealed	55	185	
6. Spring, Douglas Coal horizon (3575' B.)	--	185	85
7. Concealed	15	200	
Pottsville Series—New River Group (530')			
8. Sandstone, Upper Nuttall, massive, with small pebbles, cliff rock	45	245	
9. Concealed	165	410	
10. Sandstone, Harvey, massive, pebbly, cliff rock	45	455	
11. Fire clay spring, Castle Coal horizon (3305' B.)	--	455	270
12. Concealed	154	609	
13. Spring, with coal, Sewell (3150' B.); (Prospect No. 339 on Map II); visible	1	610	155
14. Concealed	15	625	
15. Steep bank, with sandstone, Welch	50	675	
16. Concealed in bench	10	685	
17. Concealed in steep bank, with sandstone, Upper Raleigh (3035' B.)	45	730	120
Mauch Chunk Series—Bluestone Group (35')			
18. Shale, red	35	765	
Mauch Chunk Series—Princeton Conglomerate (145')			
19. Sandstone, Princeton, massive, partly concealed, pebbly, to Three Forks of Gauley	145	910	180

MEASURED SECTIONS, DRY FORK DISTRICT.

Dry Fork District occupies an immense area in the northeastern corner of the county next to Tucker, Grant, Pendleton, and Pocahontas Counties, including a portion of the valley of Shavers Fork of Cheat River and a considerable part of the valley of Dry Fork of Cheat with its principal tributaries of Glady Fork, Laurel Fork, Red Creek, and Gandy Creek. Its surface geology ranges from the Conemaugh Series of the Pennsylvanian down through the entire Mississippian and into the Chemung Series of the Devonian. In a considerable part of the district the rocks lie flat enough to make careful vertical measurements and long exposures are afforded in the high mountains which enclose the deeply eroded valleys.

The three following sections were measured in the valley of Shavers Fork and principally illustrate the Mississippian rock column, with fragments of the Pennsylvanian above and the Devonian below:

Bickle Knob Section.

Dry Fork District; starting with top of Bickle Knob at southern end of McGowan Mountain and extending southward to Shavers Fork of Cheat River at Meadows Station; gentle southeast dip; measured with aneroid along strike and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—New River Group (428′+)			
1. Concealed, with sandstone boulders, in steep slope	271	271	
2. **Coal blossom, Sewell** (3735′ B.); Charles Baker Exposure (**No. 361 on Map II**); reported about	2	273	273
3. Concealed, with yellow, sandy soil	155	428	
Mauch Chunk Series—Bluestone and Princeton Groups (35′)			
4. **Sandstone, Princeton**; represented by wide shoulder along which there are many large boulders with quartz pebbles (3545′ B.)	35	463	190
Mauch Chunk Series—Hinton Group (255′)			
5. Shale, red, partly concealed	145	608	
6. **Sandstone, Upper Bellepoint?**, reddish-brown, flaggy	20	628	165
7. Shale, red, with a little sandstone, partly concealed	65	693	
8. **Sandstone, Stony Gap**, reddish-brown, fairly coarse	25	718	90
Mauch Chunk Series—Bluefield Group (530′)			
9. Shale, red, partly concealed	165	883	
10. **Sandstone, Bertha?**, green, flaggy	5	888	
11. Shale, red	15	903	
12. **Sandstone, Bradshaw?**, quite shaly; mostly red shale with streaks of sandstone	35	938	
13. Shale, red, partly concealed	60	998	
14. **Sandstone, Droop**, green, flaggy	10	1008	290
15. Concealed, with red shale	85	1093	

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
16. Sandstone, Webster Springs, greenish-gray, cross-bedded (2865' B.)	50	1143	135
17. Concealed, with gray limestone, Glenray Limestone	30	1173	
18. Limestone, Glenray, gray, fairly pure, with marine fossil fragments; crinoids, etc.	10	1183	
19. Concealed, horizon of Lillydale Shale	60	1243	
20. Sandstone, Edray, greenish-gray, shaly (2760' B.)	5	1248	105
Greenbrier Series (240')			
21. Limestone, Alderson, partly dark, weathering yellowish, partly gray and somewhat oolitic, weathering white, fairly pure, with marine fossil fragments; brachiopods, crinoids, cup corals	40	1288	
22. Concealed	10	1298	
23. Sandstone, Cypress?, dark, shaly, calcareous, with a little impure limestone	10	1308	60
24. Limestone, Union, (Gasper portion), concealed mostly, with a little gray oolite	35	1343	
25. Limestone, Union (Gasper portion), gray, weathering white, pure	30	1373	
26. Limestone, Union, (Bethel Sandstone stage), concealed partly, with red, calcareous sandstone and reddish, impure limestone	20	1393	
27. Limestone, Union, (Fredonia portion), dove-colored, weathering white, partly oolitic, with a few fossil fragments (2520' B.)	95	1488	180
Pocono Series (95')			
28. Concealed	30	1518	
29. Sandstone, Broad Ford, greenish-gray	10	1528	
30. Concealed, Broad Ford Sandstone	30	1558	
31. Sandstone, Broad Ford, greenish-gray, massive (2425' B.)	25	1583	95
Catskill Series (270'+)			
32. Concealed (river-terrace boulders at 2115' B.)	240	1823	
33. Sandstone, greenish-brown, or greenish-gray, with red shale	20	1843	
34. Concealed by flood-plain deposits to Shavers Fork at foot-bridge near Meadows Station (2155' B.)	10	1853	

Bowden Section.

Dry Fork District; starting on the end of Middle Point 2 miles northeast of Bowden and extending southwestward with certain offsets to the mouth of Taylor Run; measured with aneroid, mostly along the strike, and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (295'+)			
1. **Sandstone, Upper Connoquenessing,** white, massive, with abundant angular, white quartz pebbles (3630' B.)	40	40	40
2. Concealed	100	140	
3. Concealed in steep bluff, with sandstone boulders	15	155	
4. Concealed in gentle slope	75	230	
5. **Sandstone, Lower Gilbert,** gray, massive	5	245	205
6. Concealed in slope and bench	50	295	
Pottsville Series—New River Group (325')			
7. **Sandstone, Nuttall,** gray, massive, coarse, makes cliff (3315' B.)	60	355	110
8. Concealed, (**Hughes Ferry Coal** belongs at top)	45	400	
9. **Sandstone, Harvey,** brown, massive, makes cliff (3260' B.)	10	410	55
10. Concealed, (**Castle Coal** belongs at top)	85	495	
11. Fire clay shale at spring, **Sewell "B" Coal** horizon (3175' B.)	--	495	
12. Concealed and dark shale, **Hartridge**	32	527	
13. **Coal,** soft, good, 3' 0" to--2' 7" } (3' 0") **Sewell** (3140' B.) J. B. Ward, Jr., Prospect (**No. 356** on **Map II**)	3	530	120
14. **Coal,** bony--0 5 }			
(Thence offsetting about 1000 feet farther west):			
15. Shale, gray, and concealed	15	545	
16. **Sandstone, Welch,** gray, coarse	10	555	
17. Concealed	15	570	
18. Slate and **coal** fragments at shot hole, **Welch Coal** (3130' B.)	--	570	40
19. Concealed in steep bluff	30	600	
20. Sandstone, shelving, and concealed, **Upper Raleigh (Sharon)**	20	620	
21. Fire clay shale at shot hole, **Fire Creek Coal** horizon (3080' B.)	--	620	50
Mauch Chunk Series—Bluestone Group (130')			
22. Concealed	30	650	
23. Shale, green, partly concealed, with marine fossils (3000' B.). **Lot 391;** contains **Fenestella** sp., according to Tilton	50	700	
24. Flat bench and concealed	25	725	
25. Fire clay shale, streak	--	725	
26. Concealed	25	750	
Mauch Chunk Series—Princeton Conglomerate (25')			
27. **Sandstone, Princeton,** gray, hard, massive, with numerous large white quartz pebbles (2925' B.)	25	775	155
Mauch Chunk Series—Hinton and Bluefield Groups (555')			
28. Shales, red, with shaly sandstones (2485' B.)	440	1215	
(Thence offsetting to western side of Stalnaker Run):			

29. Limestone, Reynolds, shaly, with marine fossils, only fragments exposed (2485′ B.)	--	1215	
30. Shale, green, calcareous	15	1230	
31. Sandstone	5	1235	
32. Shale, Bickett, red, partly concealed	40	1275	
33. Sandstone, Webster Springs, green, flaggy, and shaly	20	1295	520
34. Limestone, Glenray, gray, poorly exposed	25	1320	
35. Concealed, horizon of Lillydale Shale (2370′ B.)	10	1330	35
Greenbrier Series (115′+)			
36. Limestone, Alderson, dark, impure, mostly weathering yellow, partly shaly and partly hard, with a little black chert and with abundant marine fossils (2325′ B.). Lot 372; contains Zaphrentis spinulosa, crinoid stems, Stenopora sp., Archimedes sp., Fenestella sp., Orthotetes kaskaskiensis, Productus ovatus, Diaphragmus elegans, Spirifer pellaensis, Composita subquadrata, Allorisma clavata, Phillipsia sp. (pygidium), according to Tilton	45	1375	
37. Limestone, Union, (Gasper portion), shaly limestone and calcareous shale	25	1400	
38. Limestone, Union, (Gasper portion), gray and oolitic at top, yellow at base, with marine fossils; crinoids and a few brachiopods	10	1410	
39. Limestone, Union, (Gasper portion), dark, impure, with a few marine fossils; crinoids (Pterotocrinus?)	5	1415	85
40. Shale, red	4	1419	
41. Limestone, Union (Fredonia portion), gray, oolitic, siliceous, cross-bedded	6	1425	
42. Sandstone, red, shaly	5	1430	
43. Concealed to road at Chestnut Grove School (2240′ B.)	15	1445	

Collett Gap Section.

Dry Fork District; starting at the top of Spruce Knob of Shavers Mountain 0.5 mile southwest of Collett Gap and 4 miles southwest of Alpena, and extending eastward 0.6 mile to the public road; dip northwestward 4° to 8°; measured with aneroid, corrected for dip, and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—New River Group (15′+)			
1. Sandstone, Upper Raleigh (Sharon), gray, coarse, with large white quartz pebbles (3805′ B.); covers knob	15	15	15
Mauch Chunk Series—Bluestone Group (285′)			
2. Shale, green, fissile, soft, partly concealed	135	150	

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
3. Shale, red, partly concealed to flat bench (3670′ B.); peneplain level	50	200	
4. Sandstone, concealed, and red shale	100	300	
Mauch Chunk Series—Princeton Conglomerate (40′)			
5. **Sandstone, Princeton,** greenish-brown, partly flaggy, partly massive, medium-coarse, hard, cliff rock (3565′ B.)	40	340	325
Mauch Chunk Series—Hinton Group (400′)			
6. Shale, red, partly concealed	360	700	
7. **Sandstone, Stony Gap,** green, flaggy, fine-grained	40	740	400
Mauch Chunk Series—Bluefield Group (197′)			
8. Shale, red, partly concealed	108	848	
9. **Sandstone, Webster Springs,** green, thick-bedded, hard	14	862	122
10. Concealed	75	937	
Greenbrier Series (209′)			
11. **Limestone, Alderson,** mostly dark-gray, weathering partly white and partly yellow; partly impure and partly good, with marine fossil fragments and a little oolite (3085′ B.). **Sample No. 700R,** land of **E. R. Dyer**	40	977	
12. **Sandstone, Cypress,** calcareous	7	984	122
13. **Limestone, Union,** (**Gasper** portion), dove-colored, weathering white, pure. **Sample No. 699R,** land of **E. R. Dyer**	27	1011	
14. Concealed, with limestone	27	1038	
15. **Limestone, Union, (Fredonia** portion), dark-gray, slightly siliceous, oolitic (2960′ B.); burned for agricultural lime. **Sample No. 698R,** land of **E. R. Dyer**	108	1146	
Pocono Series (______)			
16. **Sandstone, Broad Ford,** greenish-gray, thick-bedded, makes flats, not measured	--	---	

The following section records a considerable part of the Mississippian as well as the entire Catskill and a portion of the Chemung Series of the Devonian as these measures occur in the valley of Glady Fork:

Evenwood Section.

Dry Fork District; starting in the State Road on eastern slope of Shavers Mountain 0.4 mile west of Alpena and following this road eastward to Alpena; thence offsetting 0.6 mile southward to the road fork south of Low Gap Run and traversing southeastward along the State road to Evenwood and continuing eastward with the same road to the axis of the Blackwater Anticline on the western side of Middle Mountain 0.2 mile east of Flannigan School; dip west, 5° to 25°;

thickness is estimated from pacing and vertical angles and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Mauch Chunk Series—Bluefield Group (131'+)			
1. Sandstone, Droop, greenish-brown, flaggy, and cross-bedded, medium-coarse (2865' B.)	10	10	10
2. Shale, Talcott, red, partly concealed	15	25	
3. Shale, Ada, dark-green, fissile, calcareous, with abundant marine fossils; brachiopods (Orthotetes, Diaphragmus, Productus, Spirifer pellaensis, pelecypods (Pectens?), ostracods (2850' B.)	30	55	
4. Limestone, Reynolds, shaly, with marine fossils; brachiopods (Orthotetes)	1	56	46
5. Shale, Bickett, red	50	106	
6. Shale, Lillydale, dark-green, calcareous, with marine fossils (2835' B.); brachiopods, pelecypods, and fenestelloids	25	131	75
Greenbrier Series (231')			
7. Limestone, Alderson, dark, weathering yellow, shaly, with abundant marine fossils; brachiopods (Productus, Composita, etc.), crinoids, cup corals	25	156	
8. Shale, green and red	10	166	
9. Limestone, Alderson, dark, weathering yellow, shaly, with marine fossils; brachiopods (Productus, etc.), crinoids, cup corals	25	191	60
10. Limestone, Union, (Gasper portion), gray, weathering white, oolitic, pure	15	206	
11. Shale, green, calcareous; limestone, shaly and siliceous; shale, red; and sandstone, red; all weathered and poorly exposed, Bethel Sandstone stage	50	256	65
12. Limestone, Union, (Fredonia portion), dove-colored, pure, with marine fossils; numerous crinoids	15	271	
13. Limestone, dark and shaly at top, red, sandy, and hard at base, with marine fossils; brachiopods	15	286	
14. Shale, red	15	301	
15. Limestone, red, sandy, and impure	10	311	
16. Shale, red	10	321	
17. Limestone, Union, (Fredonia portion), light-gray, weathering white, oolitic, very pure	7	328	72
18. Limestone, Pickaway, dark, weathering yellow, hard, with marine fossils, crinoids, cup corals	15	343	
19. Shale, Upper and Lower Taggard, red	5	348	
20. Limestone, Patton, dove-colored, pure, hard	6	354	

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
21. **Limestone, Patton** (continued), yellow, hard, sandy, to Alpena (2718' L.)	10	364	36
(Thence offsetting to road fork 0.6 mile southward, at 2829' L.):			
Pocono Series (60')			
22. **Sandstone, Broad Ford,** greenish-gray, partly weathering white, thick-bedded, with some white quartz pebbles (2805' B.)	60	424	60
Catskill Series (1025')			
23. Shale, red, with a little sandstone	75	499	
24. **Shale, Saxton,** pale-green, fissile, with plant fossils (2760' B.)	15	514	90
25. Sandstone, greenish-gray, mostly massive	20	534	
26. Shale, green and red, partly concealed, to ravine	100	634	
27. Sandstone, greenish-gray	10	644	
28. Shale, red	75	719	
29. Sandstone, partly green, and partly red, with red and green shale, to foot of hill (2625' B.)	60	779	
30. Concealed across Glady Fork, estimated	50	829	
31. Sandstone, greenish-gray, cross-bedded, coarse, hard, makes long point north of Evenwood and east of Glady Fork	50	879	365
32. Shale, red and concealed	400	1279	
33. Sandstone, greenish-brown, fine-grained, flaggy, and cross-bedded, with a zone of abundant plant stems near top and also **Scolithus**? rods near top; visible at turn of road 0.4 mile east of Evenwood. **(Lot 440)**; Note—Tilton does not ascribe these rods to **Scolithus**; see Chapter XV	100	1379	500
34. Shale, red	20	1399	
35. Sandstone, partly red and partly green, with beds of red shale (2805' B.)	50	1449	70
Chemung Series (570'+)			
36. Shale, olive-green	30	1479	
37. **Sandstone, Hendricks,** greenish-brown, thick-bedded, with marine fossils; crinoids	20	1499	50
38. Shale, green	20	1519	
39. Sandstone, green	5	1524	
40. Shale, green, with a little flaggy sandstone and a few marine fossils; exposed for 0.7 mile, nearly along strike, estimated	200	1724	
41. Concealed across bench of Flannigan Run, mostly shale	75	1799	
42. Sandstone, green, flaggy	15	1814	315
43. Shale, green	100	1914	

	Thick-ness. Feet.	Total. Feet.	Inter-vals. Feet.
44. Sandstone, green, flaggy	5	1919	
45. Shale, green, sandy	50	1969	
46. **Sandstone, Elkins**, greenish-brown fragments, with a little white quartz conglomerate and with plant stems, also with marine fossils; crinoids; brachiopods (*Schizophoria?* or *Douvillina?*, *Spirifer*, *Schuchertella*, *Atrypa reticularis*, *Atrypa spinosa?*, *Camarotoechia*). Makes summit of Blackwater Anticline, (3105′ B.); estimated	50	2019	205

The following section, measured in Tucker County at the type locality of the Hendricks Sandstone, principally indicates the nature of the upper portion of the Chemung Series of the Devonian. At this locality there are abundant fucoids and carbonized plant stems in the Valley Head Sandstone, but as pointed out by Dr. David White, who inspected the exposure and made a collection, there is a slight angular unconformity separating the upper and lower portions of the formation. The propriety of giving the same name to deposits above and below an unconformity might well be questioned but on the other hand the writer is inclined to believe that such erosion as occurred is merely a local phenomenon and that the fossil plants above and below the break and the continued reddish-brown color indicate a close relationship of the beds:

Roaring Run Section.

Black Fork District, Tucker County; starting in a highway gap between two low knobs one-third mile north of Hambleton and thence extending westward down the gorge of Falls Run to the Dry Fork River road, and thence westward along this road to the mouth of Roaring Run at the water-tank one-half mile northwest of Hambleton; dip southeast; measured with aneroid mainly by offsets along the strike, and arranged in descending stratigraphic order by David B. Reger.

	Thick-ness. Feet.	Total. Feet.	Inter-vals. Feet.
Catskill Series (40′+)			
1. Sandstone, reddish-brown, cross-bedded	40	40	40
Chemung Series (267′+)			
2. Shale, olive-green, fucoidal	1	41	

			Thickness. Feet.	Total. Feet.	Intervals. Feet.
3.	Sandstone, greenish-brown, thick-bedded, hard ----6′	Hendricks Sandstone (type locality)	20	61	21
4.	Shale, olive-green, argillaceous, fucoidal --------8				
5.	Sandstone, greenish-brown, hard, ripple-marked at top, ferruginous at base, with abundant marine fossils (1800′ B.); exposed in road; Lot 400; contains plant stems (algae), branching bryozoa, **Camarotoechia subarcuata, Sphenotus contractus, Leptodesma medon** (abundant), according to Tilton -----6				
6.	Sandstone, greenish-brown, cross-bedded, hard, with plant stems; visible in Falls Run ravine		63	124	
7.	Shale, red		2	126	
8.	Sandstone, reddish-brown, cross-bedded, with shaly conglomerate at base and also plant stems; makes the falls of Falls Run, visible from Dry Fork River road		35	161	100
9.	Shale, greenish-brown		15	176	
10.	Sandstone, greenish-brown		10	186	
11.	Shale, greenish-brown		10	196	
12.	Sandstone, greenish-brown, lenticular, 0′ to		4	200	
13.	Shale, greenish-brown		8	208	
14.	Sandstone, greenish-brown		8	216	
15.	Shale, reddish-brown, with concretionary weathering		15	231	
16.	Sandstone, reddish-brown, hard		1	232	
17.	Shale, reddish-brown, with concretionary weathering		25	257	96
18.	**Sandstone, Valley Head,** partly reddish and partly greenish-brown		15	272	
19.	**Sandstone, Valley Head** (continued), reddish-brown, mostly conglomerate with quartz and shale pebbles, and with abundant large carbonized plant stems and a few marine fossils (pelecypods) and worm tracks, 10′ to		15	287	
Angular unconformity here					
20.	Shale, **Valley Head Sandstone** (continued), reddish-brown, with sandy conglomerate layers, and with large concretions? or tree fossils? to Roaring Run at concrete bridge, level of railroad (1675′ B.); many fucoids on loose				

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
boulders; Lot 399 from talus boulders of Nos. 18, 19, and 20	20	307	

The four following sections, all in Tucker County and previously published in the Report on that county, pages 134-137, inclusive, closely adjoin Randolph County and illustrate the nature of the strata along the Dry Fork River front. In the present Report numerous changes and additional correlations have been made on account of the more extended knowledge of these strata and the numbers of coal prospects have been harmonized with those of Randolph County Map II:

Otter Creek Section.

Dry Fork District, Tucker County; starting at the northern rim of the Green Mountain plateau west of Coal Run and 1.5 miles southwest of Otter Station and extending northward to Otter Creek one-fourth mile west of Coal Run; measured with aneroid along strike of rocks and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha Group (350')			
1. Sandstone, Homewood, massive, cliff, very pebbly, makes plateau (top, 3220' B.)	65	65	65
2. Concealed	40	105	
3. Sandstone, Upper Connoquenessing, massive, pebbly	75	180	
4. Concealed, with shale	40	220	
5. Shale, Quakertown, dark, sandy	14	234	
6. Coal, soft 1' 1"; 7. Shale, dark 0 8; 8. Coal, bony 0 3 — (2' 0") Quakertown (Winifrede?) (2984' B.) Otter Creek Boom & Lumber Co. Exposure (No. 65 on Map II)	2	236	171
9. Fire clay shale, dark	3½	239½	
10. Coal, slaty, (0' 6"), (2980' B.)	0½	240	
11. Shale, sandy, dark, with plant fossils and Lingula near middle, Winifrede Limestone?	20	260	
12. Sandstone, Lower Gilbert, massive, cliff rock	68	328	
13. Coal, medium-soft, (1' 9"), Gilbert (2890' B.), Otter Creek Boom & Lumber Company Exposure (No. 157 on Map II)	2	330	94
14. Fire clay shale and sandy shale	20	350	
Pottsville Series—New River Group (270')			
15. Sandstone, Upper and Lower Nuttall, massive, pebbly, cliff, coal spars at base	70	420	
16. Shale, Upper Iaeger, dark, shaly	24	444	

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
17. Coal, Hughes Ferry, soft, (0′ 11″) (2775′ B.), Otter Creek Boom & Lumber Co. Exposure (No. 188 on Map II)	1	445	115
18. Fire clay shale and dark shale, Sandy Huff	24	469	
19. Coal 0′ 7″; 20. Slate, black 0 3; 21. Coal 0 4 — (1′ 2″) Castle (2750′ B.) Otter Creek Boom & Lumber Company Exposure (No. 213 on Map II)	1	470	25
22. Fire clay shale and sandy shale	10	480	
23. Sandstone, Lower Guyandot, massive	10	490	
24. Shale, Hartridge, dark	9½	499½	
25. Coal, Sewell (0′ 6″), (2720′ B.), Otter Creek Boom & Lumber Company Exposure (No. 346 on Map II)	0½	500	30
26. Sandstone, Sharon (Upper Raleigh), massive	30	530	
27. Concealed, with sandstone and shale (2600′ B.)	90	620	120
Mauch Chunk Series—Bluestone Group (35′)			
28. Shale, red	35	655	
Mauch Chunk Series—Princeton Conglomerate (15′)			
29. Sandstone, Princeton, massive	15	670	50
Mauch Chunk Series—Hinton and Bluefield Groups (590′)			
30. Shale, variegated	20	690	
31. Shale, red, partly concealed	400	1090	
32. Sandstone, green, fine-grained	20	1110	
33. Shale, red, and concealed (1960′ B.)	150	1260	590
Greenbrier Series (140′)			
34. Limestone, partly concealed, to mouth of Coal Run	140	1400	

Elklick Section.

Dry Fork District, Tucker County; starting on the head of Elklick Run and extending southward and southwestward down the run to its mouth at Elklick Station; measured with aneroid and arranged in descending stratigraphic order by David B. Reger; uncorrected for southward rise of rocks and therefore showing intervals somewhat less than true vertical measurement.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
1. Red shale, base of Mauch Chunk Series (2590′ B.)	--	---	
Greenbrier Series (285′)			
2. Limestone, shaly 10′; 3. Shale, limy 20; 4. Limestone 20; 5. Shale, limy 15; 6. Limestone, gray, shaly 30; 7. Shale, red and limy 15 — Alderson Limestone	110	110	110
8. Limestone, Union, (Gasper portion), hard, gray	20	130	

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
9.	Shale, red, **Bethel Sandstone** zone	50	180	70
10.	Limestone 10′			
11.	Shale, red 20			
12.	Limestone 5			
13.	Shale, red 10			
14.	Limestone, hard, gray, cavernous (2305′ B.) 60			
10.–14.	**Union (Fredonia portion)**	105	285	105
Pocono Series (85′)				
15.	**Sandstone, Broad Ford**, gray, massive	25	310	
16.	Shale, gray, sandy, with sandstone streaks	20	330	45
17.	Sandstone, massive, conglomeratic, **Berea Sand?**, (2220′ B.)	40	370	
Catskill Series (320′)				
18.	Sandstone, shaly, **Gantz Sand**	45	415	
19.	Shale, red	75	490	160
20.	Sandstone, massive, reddish-brown, with streaks of shale, **Fifty-foot and Thirty-foot Sands?**	110	600	
21.	Shale, red	15	615	
22.	Sandstone, massive, **Gordon Stray Sand?**, to Dry Fork River (1900′ B.)	75	690	

Jenningston Section.

Dry Fork District, Tucker County; starting on the Middle Mountain road at the Randolph-Tucker line and descending eastward with this road to the foot of the mountain one-half mile north of Jenningston; measured with aneroid along approximate strike of rocks and arranged in descending stratigraphic order by David B. Reger.

		Thickness. Feet.	Total. Feet.
Catskill Series (800′+)			
1.	Sandstone, shaly and shale, red	65	65
2.	Sandstone, red, flaggy	25	90
3.	Shale, red	25	115
4.	Sandstone, red, flaggy	30	145
5.	Shale, red, with red, flaggy sandstone	170	315
6.	Shale, green, with plant fossils (**Archaeopteris**) and bivalve fragments (pelecypods?) in saddle of ridge (2520′ B.)	5	320
7.	Sandstone, reddish-brown	105	425
8.	Shale, red, with sandstone	120	545
9.	Sandstone, reddish-brown, massive	150	695
10.	Concealed and red shale	30	725
11.	Sandstone, massive	60	785
12.	Concealed to Dry Fork (2040′ B.)	15	800

Dry Fork Section.

Dry Fork District, Tucker County; starting at road fork 1.5 miles northeast of Dry Fork village and descending southwestward along road to Red Creek at Dry Fork village; measured with aneroid and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
1. Limestone, Greenbrier Series	--	---	
Pocono Series (185')			
2. Sandstone, Broad Ford, gray, massive, with some reddish-brown ferruginous material	55	55	55
3. Shale, sandy, partly concealed	60	115	
4. Fire clay and dark shale, Sunbury, with a few worm borings and plant fragments	20	135	
5. Sandstone, Berea, shaly	25	160	
6. Shale, gray, sandy (2560' B.)	25	185	130
Catskill Series (380'+)			
7. Shale, red, partly concealed	65	250	
8. Sandstone, Fifty-foot Sand?	10	260	
9. Shale, red	150	410	
10. Sandstone, massive, with shaly streaks, Gordon Stray Sand?	85	495	310
11. Shale, red	20	515	
12. Sandstone, shaly	10	525	
13. Shale, red	10	535	40
14. Sandstone, reddish-brown, shaly, with plant fossils, Gordon Sand?, to Red Creek at Dry Fork village (2180' B.)	30	565	

The four following sections, all in Tucker County and previously published in the Tucker Report, pages 139-144, inclusive, are in the valley of Red Creek and illustrate the nature of the Pennsylvanian and Mississippian strata in this predominantly synclinal area. Numerous changes have been made to indicate the more advanced knowledge of the Mississippian which is now available. The region in question is very rough but rather good exposures are afforded by the deep ravines which cut into the mountain on the Tucker County side of Red Creek. On the south side, in Randolph County, the opportunities to measure sections are not so favorable:

Laneville Section.

Dry Fork District, Tucker County; starting at the top of Wiess Knob at the southern extremity of Cabin Mountain and extending southward to Red Creek 0.8 mile west of Laneville; measured with aneroid along approximate strike and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Allegheny Series (150'+)			
1. Sandstone, Upper Freeport, massive, capping Wiess Knob	35	35	35
2. Concealed in steep slope, with sandstone	115	150	
Pottsville Series—Kanawha Group (180')			
3. Steep bluff, with sandstone, Homewood	25	175	140
4. Concealed in slope	30	205	

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
5. Sandstone, Upper Connoquenessing, massive	105	310	135
6. Concealed in bench	20	330	
Pottsville Series—New River Group (345')			
7. Sandstone, Upper and Lower Nuttall, massive, cliff	80	410	100
8. Concealed	20	430	
9. Sandstone and concealed, in steep slope	220	650	
10. Sandstone, Upper Raleigh (Sharon?) (3745' B.), massive, pebbly	25	675	265
Mauch Chunk Series (900')			
11. Shale, red, partly concealed	255	930	
12. Sandstone, flaggy	10	940	265
13. Shale, red, partly concealed (2910' B.)	570	1510	
14. Limestone, Glenray, hard	25	1535	
15. Concealed, Lillydale Shale horizon	40	1575	635
Greenbrier Series (365')			
16. Limestone, Alderson, partly concealed	110	1685	
17. Sandstone, Cypress	45	1730	155
18. Limestone, Union, hard, gray, partly concealed (2480' B.)	210	1940	
Pocono Series (50')			
19. Sandstone, pebbly, to Red Creek (2430' B.)	50	1990	

Little Stonecoal Run of Red Creek Section.

Dry Fork District, Tucker County; starting at the "Big Rocks" 2.1 miles northeast of Laneville and extending southward down Little Stonecoal Run to its intersection with Red Creek 1.5 miles eastward from Laneville; measured with aneroid along strike and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Allegheny Series (150'+)			
1. Sandstone, Upper Freeport (top, 3860' B.), massive, very pebbly, forms cliff known as "Big Rocks" on top of mountain	35	35	35
2. Concealed	25	60	
3. Sandstone, Lower Freeport, massive	50	110	75
4. Concealed	40	150	
Pottsville Series—Kanawha Group (320')			
5. Sandstone, Homewood, pebbly, partly concealed	75	225	115
6. Concealed	185	410	
7. Shale, sandy and sandstone	15	425	
8. Shale, dark, sandy	35	460	
9. Sandstone	5	465	
10. Shale, dark, with plant fossils	5	470	
Pottsville Series—New River Group (270')			
11. Sandstone, Upper and Lower Nuttall, massive	45	515	290
12. Shale, dark, sandy	10	525	

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
13.	Sandstone, Guyandot, massive	25	550	
14.	Concealed and shale	18	568	
15.	Sandstone, Lower Guyandot, shaly	10	578	
16.	Shale, Hartridge, black, with plant fossils	20	598	
17.	Coal, soft 0' 4"			
18.	Slate, dark 0 4			
19.	Coal 0 2½ — (1' 9") Sewell (Sharon?) (3260' B.) Robert Bridges Heirs Prospect (No. 379 on Map II)	2	600	85
20.	Slate, dark, bony 0 2½			
21.	Coal, soft 0 8			
22.	Shale, dark, partly concealed	40	640	
23.	Sandstone, Upper Raleigh (Sharon?) (3120' B.), massive, cliff rock, with Sigillaria and Cordaites (very numerous)	100	740	140
	Mauch Chunk Series—Bluestone Group (145')			
24.	Concealed	50	790	
25.	Sandstone, Glady Fork?, massive, greenish	15	805	65
26.	Shale, red and green	80	885	
	Mauch Chunk Series—Princeton Group (85')			
27.	Sandstone, Princeton (2890' B.), massive, with large angular quartz pebbles, 1" to 2" in diameter	85	970	165
	Mauch Chunk Series—Hinton Group (200'+)			
28.	Shale, red, partly concealed	20	990	
29.	Sandstone, Falls Mills?, green	5	995	25
30.	Concealed	75	1070	
31.	Sandstone, massive, pebbly at top	40	1110	115
32.	Concealed, with red shale, to Red Creek at mouth of Little Stonecoal Run (2690' B.)	60	1170	

Stonecoal Run of Red Creek Section.

Dry Fork District, Tucker County; starting at an elevation of 3715' B. with the record of the Robert Bridges Estate No. 2 Coal Test Boring, located just west of Stonecoal Run 3.3 miles northeast of Laneville; portion below 190 feet measured with aneroid by David B. Reger along strike of rocks and down steep gully of Stonecoal Run to its mouth, starting at stratigraphic level of top of boring.

		Thickness. Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
	Conemaugh Series (79' 1"+)						
1.	Clay, sand, and gravel	20	0	20	0		
2.	Sandstone, Upper Mahoning, rotten	2	0	22	0		
3.	Shale, blue, tough, with soft sticky partings	44	0	66	0		
4.	Sandstone, Lower Mahoning	12	9	78	9		
5.	Shale, Uffington	0	4	79	1		

	Thickness. Ft.	In.	Total Ft.	In.	Intervals. Ft.	In.
Allegheny Series (110′ 11″)						
6. Coal ---------0′ 3″ 7. Shale --------0 5 8. Coal ---------3 8 9. Shale --------0 10 10. Coal ---------3 1 Upper Freeport (Davis)	8	3	87	4	87	4
11. Shale, with coal partings --------	1	8	89	0		
12. Shale, blue --------------------	9	0	98	0		
13. Fire clay ----------------------	6	2	104	2		
14. Shale, sandy -------------------	7	1	111	3		
15. Shale, dark --------------------	0	10	112	1		
16. Coal ---------0′ 4″ 17. Shale, dark --0 2 18. Coal ---------0 11 Lower Freeport	1	5	113	6	26	2
19. Shale, dark --------------------	1	0	114	6		
20. Shale, light, sandy -------------	7	6	122	0		
21. Sandstone, slightly mixed with shale -------20′ 0″ 22. Sandstone, hard- 7 0 Lower Freeport	27	0	149	0		
23. Shale, sandy -------------------	25	0	174	0		
24. Shale, dark --------------------	3	0	177	0		
25. Shale, sandy -------------------	2	0	179	0		
26. Shale, dark --------------------	0	9	179	9		
27. Coal, slaty ----0′ 6″ 28. Coal, clean ---0 3 29. Coal ----------1 9 Upper Kittanning	2	6	182	3	68	9
30. Shale, light --------------------	0	6	182	9		
31. Shale, sandy, to bottom ----------	7	3	190	0		
(Continued with surface measurements down Stonecoal Run):						
Pottsville Series—Kanawha Group (155′)						
32. Sandstone, Homewood (top, 3590′ B.), massive, great cliff, very pebbly ---------------------	40	0	230	0		
33. Concealed ----------------------	115	0	345	0		
Pottsville Series—New River Group (335′)						
34. Sandstone, Upper and Lower Nuttall, great cliff --------------	105	0	450	0		
35. Concealed ----------------------	45	0	495	0		
36. Sandstone, Lower Guyandot, massive, medium-grained --------	40	0	535	0		
37. Shale, Hartridge, black, fissile, with marine fauna, pelecypods and brachiopods (possibly Lingula) -------------------	18	4	553	4		
38. Coal, Sewell (Sharon?), soft, Robert Bridges Heirs Prospect (No. 380 on Map II) (3225′ B.)	1	8	555	0	372	9
39. Shale, sandy, dark, partly concealed -----------------------	35	2	590	2		
40. Sandstone, Welch, massive-------	25	0	615	2		
41. Slate, black, streak, Welch Coal horizon --------------------	--	--	615	2		

	Thickness. Ft.	In.	Total Ft.	In.	Intervals. Ft.	In.
42. Sandstone, Upper Raleigh (Sharon?), massive, with plant fossils at base	45	0	660	2		
43. Coal, good ----0' 4" 44. Slate, bony ---0 5 45. Coal, bony ----2 6 46. Slate, bony ---0 4 47. Coal, bony ----1 3 } Fire Creek (3115' B.) Robert Bridges Heirs Prospect (No. 434 on Map II)	4	10	665	0	110	0
48. Fire clay shale, sandy (3100' B.)	15	0	680	0		
Mauch Chunk Series—Bluestone Group (175')						
49. Shale, red	15	0	695	0		
50. Sandstone, Bent?, massive	30	0	725	0	60	0
51. Shale, green and red	60	0	785	0		
52. Concealed	15	0	800	0		
53. Sandstone, Glady Fork?, green, flaggy	30	0	830	0	105	0
54. Shale, greenish-gray	25	0	855	0		
Mauch Chunk Series—Princeton Conglomerate (15')						
55. Sandstone, Princeton, massive, large quartz pebbles 1" to 1½" diameter	15	0	870	0	40	0
Mauch Chunk Series—Hinton Group (110'+)						
56. Concealed and red shale to mouth of Stonecoal Run (2800' B.)	110	0	980	0		

Red Creek Section.

Dry Fork District, Tucker County; starting with the record of the Robert Bridges Estate No. 4 Coal Test Boring, located one-half mile west of the forks of Red Creek and 4.5 miles northeast of Laneville and having a surface elevation of 3805' B. Lower portion below 84 feet measured with aneroid by David B. Reger along strike of rocks starting at stratigraphic level of base of boring and extending eastward to Upper Kittanning Coal which outcrops on Right Fork 0.3 mile above the forks, and thence continuing down the creek to the mouth of Stonecoal Run.

	Thickness. Ft.	In.	Total. Ft.	In.	Intervals. Ft.	In.
Conemaugh and Allegheny Series (275')						
1. Clay	7	0	7	0		
2. Boulders and rotten sandstone	3	7	10	7		
3. Shale, light	11	5	22	0		
4. Shale, sandy	9	6	31	6		
5. Sandstone -- 8' 6" 6. Sandstone, broken--- 18 0 } Buffalo	26	6	58	0		
7. Shale, sandy	4	0	62	0		
8. Shale, Brush Creek, dark	8	0	70	0		
9. Coal, Brush Creek (3733' B.)	2	4	72	4	72	4
10. Shale, light	7	8	80	0		

No.	Description	Thickness Feet		Total Feet		Intervals Feet	
11.	Shale, dark	1	3	81	3		
12. 13.	Coal 1′ 3″ Coal and shale, mixed 0 6 Mahoning (Six-foot) (3722′ B.)	1	9	83	0	10	8
14.	Shale, light	0	6	83	6		
15.	Shale, sandy, to bottom of boring	0	6	84	0		
	(Section continued with surface measurements down Red Creek):						
16.	Concealed	165	0	249	0		
17.	Shale, dark, sandy	10	0	259	0		
18.	Sandstone, Lower Freeport, shaly	5	0	264	0		
19. 20.	Coal, soft 0′ 10″ Slate, black, hard 0 2 Upper Kittanning (3540′ B.) Robert Bridges Heirs Exposure	1	0	265	0	182	0
21.	Concealed	10	0	275	0		
	Pottsville Series—Kanawha Group (215′)						
22.	Sandstone, Homewood, massive, pebbly, makes 20-foot cataract at base	85	0	360	0		
23.	Slate, black, coaly, Upper Mercer Coal horizon (3440′ B.)	5	0	365	0	100	0
24.	Sandstone, massive, makes falls	25	0	390	0		
25.	Shale, dark, sandy, Kanawha Black Flint horizon	15	0	405	0		
26.	Sandstone, Upper Connoquenessing, massive	55	0	460	0		
27.	Concealed	15	0	475	0		
28.	Sandstone, shaly	2	0	477	0		
29.	Shale, Quakertown, black, peacock-colored	6	10	483	10		
30. 31.	Coal, soft, good 0′ 9″ Coal, bony 0 5 Quakertown (Winifrede?) (3320′ B.) Robert Bridges Heirs Exposure	1	2	485	0	120	0
32.	Shale, dark, sandy, with plant fossils, Winifrede Limestone horizon	5	0	490	0		
	Pottsville Series—New River Group (290′)						
33.	Sandstone, Nuttall, massive	50	0	540	0		
34.	Concealed	15	0	555	0		
35.	Shale, Upper Iaeger, dark, sandy	9	6	564	6		
36.	Coal, Hughes Ferry, Robert Bridges Heirs Exposure (3240′ B.)	0	6	565	0	80	0
37.	Shale, Lower Iaeger, dark, sandy, with Sigillaria and iron ore	35	0	600	0		
38.	Concealed	5	0	605	0		
39.	Sandstone, Lower Guyandot, massive	15	0	620	0		

		Thickness. Feet.		Total. Feet.		Intervals. Feet.	
40.	**Shale, Hartridge,** sandy, with iron ore	9	4	629	4		
41.	**Coal** ....0′ 8″						
42.	Shale, dark, sandy ..8 9						
43.	**Coal,** slaty, 0′ 2″ to..1 3						
	41–43: **Sewell** (**Sharon?**) (**3165′ B.**) Robert Bridges Heirs Exposure	10	8	640	0	75	0
44.	Shale, sandy	2	6	642	6		
45.	**Sandstone, Welch,** massive	35	0	677	6		
46.	Shale, dark	1	0	678	6		
47.	**Coal,** slaty, **Welch,** (3125′ B.), Robert Bridges Heirs Exposure	1	6	680	0	40	0
48.	Shale, dark, and concealed	15	0	695	0		
49.	**Sandstone, Upper Raleigh (Sharon?),** massive	55	0	750	0	70	0
50.	Concealed	15	0	765	0		
51.	**Sandstone, Pineville,** massive (3025′ B.)	15	0	780	0	30	0
	Mauch Chunk Series—Bluestone Group (10′)						
52.	**Shale, greenish**	5	0	785	0		
53.	Concealed	5	0	790	0		
	Mauch Chunk Series—Princeton Conglomerate (45′)						
54.	**Sandstone, Princeton,** massive, pebbly, (2970′ B.)	45	0	835	0	55	0
	Mauch Chunk Series—Hinton Group (170′+)						
55.	Shale, red, with sandstones, and concealed, to mouth of Stonecoal Run (2800′ B.)	170	0	1005	0		

In the following section, previously published in the Tucker County Report, page 234, a good view of the subdivisions of the Greenbrier Series, together with superjacent and subjacent formations, is afforded. When the original section was measured in 1919 the proper boundary between the Mauch Chunk and Greenbrier in West Virginia had not yet been established and no subdivision of the Greenbrier itself had been made. Owing to lack of time, the writer, who revised the correlations without consulting Dr. Price, did not retraverse the ground of this section but the proper subdivisions and contacts are rather apparent from the lithologic descriptions:

Harman Section.

Dry Fork District; starting on eastern slope of Rich Mountain just west of Harman and extending down mountain to base of Greenbrier; measured with aneroid by Dr. W. Armstrong Price and David B. Reger and arranged in descending stratigraphic order.

				Thickness. Feet.	Total. Feet.
	Mauch Chunk Series—Bluefield Group (45′+)				
1.	Shale, red, not measured			---	---
2.	Limestone, Reynolds			1	1
3.	Concealed and shale			19	20
4.	Limestone, Glenray, shaly, with numerous small crinoids			20	40
5.	Shale, Lillydale, red, calcareous, with marine fossils in profusion			5	45
	Greenbrier Series (340′)				
6.	Limestone, Alderson, shaly, with numerous marine fossils, crinoids, and brachiopods			35	80
7.	Concealed, partly, with shale and sandstone	23′	Cypress Sandstone		
8.	Limestone, gray, hard, with brachiopods	2		55	135
9.	Sandstone and concealed	30			
10.	Limestone, (Gasper portion), gray, hard	50′	Union Limestone		
11.	Concealed, (Gasper portion)	20			
12.	Limestone, (Gasper portion), gray, hard	5			
13.	Sandstone, (Bethel portion), flaggy	5			
14.	Concealed, (Bethel portion)	5		250	385
15.	Limestone, (Bethel portion), gray, hard	10			
16.	Concealed, (Bethel portion)	15			
17.	Sandstone, (Bethel portion)	15			
18.	Limestone, (Fredonia portion), gray, hard, partly concealed	50			
19.	Concealed, with limestone (Fredonia portion) (2360′ B.)	75			
	Pocono Series (10′+)				
20.	Sandstone, to Dry Fork (2350′ B.)			10	395

The five following sections were measured in the upper valleys of Dry Fork and Gandy Creek where the surface geology is predominantly Mississippian with certain areas of Pennsylvanian at the north, and of Devonian toward the southeast:

Hazelwood Section.

Dry Fork District; starting on Brierpatch Knob of Allegheny Mountain 1.6 miles east of Hazelwood and extending northwestward to Dry Fork 1.3 miles north of Hazelwood; gentle westward dip, measured with aneroid by David B. Reger and arranged in descending stratigraphic order without correction for dip.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—Kanawha and New River Groups (370′+)			
1. Sandstones, etc., from top of Brierpatch Knob, not examined	315	315	
2. **Sandstone, Upper Raleigh (Sharon),** white, massive, cliff rock, old panther den rocks	50	365	
3. Shale, dark	2	367	
4. **Coal, Fire Creek,** extremely bony, mostly slate (4045′ B.); Lelia M. Mauzy Prospect **(No. 436 on Map II)**	3	370	.370
Mauch Chunk Series (1410′)			
5. Concealed, covered by Pottsville boulders	65	435	
6. Shale, red	25	460	
7. Concealed mostly, with fragments of green shale	115	575	
8. Shale, red, partly concealed	930	1505	
9. **Sandstone, Droop,** massive, cliff rock (2895′ B.)	15	1520	1150
10. Concealed, with red shale (2035′ B.)	260	1780	
Greenbrier Series (260′)			
11. **Limestone, Alderson,** dark, partly shaly	50	1830	
12. **Sandstone, Cypress,** green, thick-bedded	10	1840	320
13. **Limestone, Union, (Gasper portion),** gray	50	1890	
14. Concealed	10	1900	
15. **Limestone, Union, (Gasper portion),** gray, oolitic	15	1915	
16. **Limestone, Union, (Bethel Sandstone** stage), mostly red shale with red sandstone (2465′ B.)	35	1950	110
17. River-terrace level and cancealed to railroad	65	2015	
18. Concealed to Dry Fork slightly north of highway bridge (2375′ B.)	25	2040	

Job Knob Section.

Dry Fork District; starting on Job Knob of Allegheny Mountain 1.8 miles northeast of Job and extending southwestward about one-fourth mile with a line of old coal prospects on Cunningham land; thence offsetting one-half mile northwestward to mine openings of Tory Camp Coal Company and extending southwestward to Job village; gentle westward dip; measured with aneroid by David B. Reger and arranged in descending stratigraphic order without correction for dip.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—New River Group (262′+)			
1. **Sandstone, Harvey,** white, massive, coarse, makes top of Job Knob	40	40	
2. **Coal, Castle** (4380′ B.); reported as 2′ 0″ **by Guy Cunningham**	2	42	42
3. Concealed, sandstone, and shale	86	128	

No.	Description	Thickness. Feet.	Total. Feet.	Intervals. Feet.
4.	Coal, soft, good -----3′ 2″			
5.	Coal, slightly bony -----0 10 } Sewell (4290′ B.); Warren Cunningham land, Tory Camp Coal Company Prospect (No. 387 on Map II)	4	132	90
6.	Shale, concealed, and sandstone ----------	89	221	
7.	Coal, Welch (4200′ B.), Warren Cunningham land, Tory Camp Coal Co. Prospect (No. 414 on Map II); fallen shut, reported ----------------------------	1	222	90
8.	Concealed and sandstone, Upper Raleigh (Sharon) ---------------------------	35	257	
9.	Shale (0′ 3″) ---------------------------	--	257	
10.	Coal, soft, good -3′ 3″			
11.	Slate ---0 1			
12.	Coal, soft, good -1 5 } (4′ 9″) Fire Creek (4160′ B.); Warren Cunningham land, Tory Camp Coal Company Prospect (No. 438 on Map II)	5	262	40
	Thence offsetting to same geologic horizon (base of Pottsville) one-half mile farther northwest (3870′ B.):			
	Mauch Chunk Series—Bluestone, Princeton, and Hinton Groups (710′)			
13.	Shale, green, fissile, poorly exposed -----	50	312	
14.	Shale, red, to lower end of new coal road	110	422	
15.	Shale, red, partly concealed -------------	520	942	
16.	Sandstone, Stony Gap, reddish-brown, thick-bedded, makes flat point --------	30	972	710
	Mauch Chunk Series—Bluefield Group (475′)			
17.	Shale, red, partly concealed -------------	70	1042	
18.	Sandstone, reddish-brown ---------------	5	1047	
19.	Shale, red, with shaly sandstone ---------	105	1152	
20.	Sandstone, Droop, greenish-brown, flaggy, cliff rock, makes flat (2900′ B.) ------	80	1232	260
21.	Shale, red, with shaly limestone conglomerate --------------------------------	35	1267	
22.	Sandstone, greenish-gray ---------------	5	1272	
23.	Shale, red, and concealed ---------------	140	1412	
24.	Limestone, Glenray, shaly ---------------	25	1437	
25.	Sandstone, Edray, calcareous, and shale, Lillydale ----------------------------	10	1447	215
	Greenbrier Series (115′+)			
26.	Limestone, Alderson, shaly, with marine fossils (2655′ B.); crinoids, etc. ------	30	1477	
27.	Concealed and red shale to Dry Fork at Job (2570′ B.) ----------------------	85	1562	

Haines Knob Section.

Dry Fork District; starting on Haines Knob of Rich Mountain 1.1 miles west of Job and first extending northward to State road and thence eastward down the mountain road to Dry Fork at Job;

PLATE XIX.—View of Red Roaring Run of Shavers Fork looking west. Heavy cliff at base is Princeton Sandstone followed above at the left by Upper Raleigh (Sharon) with typical Pottsville on Cheat Mountain slope.
(Photo. by E. E. Harris.)

PLATE XX.—View of Cheat Mountain looking west from point one-fourth mile south of Red Roaring Run of Shavers Fork. White cliff on upper left slope is Nuttall. Main cliff on lower left is Upper Raleigh (Sharon), making base of Pottsville. Princeton Sandstone of Mauch Chunk is barely visible at extreme lower right.
(Photo. by E. E. Harris.)

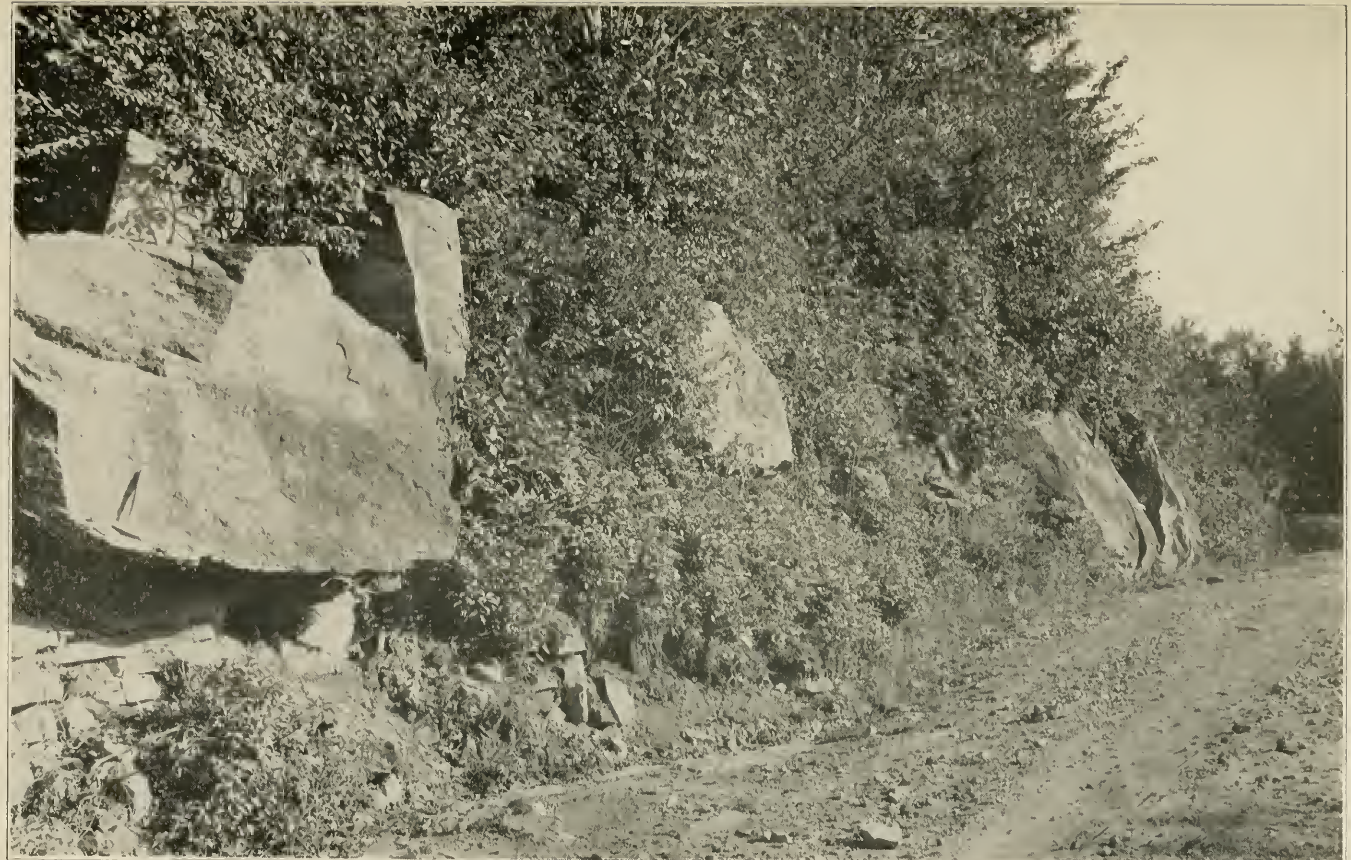

PLATE XXI.—Upper Raleigh (Sharon) Sandstone along Staunton and Parkersburg Pike just west of Cheat Bridge. Quartz pebbles are visible in large block near hammer. (Photo. by E. E. Harris.)

PLATE XXII.—View from White Top west of Cheat Bridge, looking east through wind-gap of Back Allegheny-Shavers Mountain at head of Blister Run. Foreground and mountain slopes at rear are Pottsville with Mauch Chunk in gap and in valley of Shavers Fork which intervenes. (Photo. by E. E. Harris.)

measured with aneroid along approximately level strata and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—New River Group (290'+)			
1. Concealed from top of Haines Knob	25	25	
2. **Sandstone, Harvey,** massive, pebbly, partly concealed	50	75	75
3. Concealed, with pebbly sandstone boulders	80	155	
4. Concealed, with sandy shale	32	187	
5. **Sandstone, Upper Raleigh (Sharon),** white, visible in face of mountain due east of knob	40	227	
6. **Coal, Fire Creek,** (4060' B.); Judy Brothers Prospect **(No. 439 on Map II)**; located on southeast slope of Haines Knob; now fallen shut, reported about	3	230	155
7. Concealed, with sandy shale	60	290	
Mauch Chunk Series—Bluestone Group (325')			
8. Shale, partly red, partly green and fissile	60	350	
9. Shale, red, partly concealed	265	615	
Mauch Chunk Series—Princeton Conglomerate (25')			
10. **Sandstone, Princeton,** greenish-gray, massive, hard, makes point on ridge (3650' B.)	25	640	410
Mauch Chunk Series—Hinton and Bluefield Groups (980')			
11. Shale, red	70	710	
12. **Sandstone, Falls Mills?,** reddish-brown, fairly hard, flaggy	30	740	100
13. Shale, red, partly concealed, to road summit (3407' L.)	143	883	
14. Shale, red	22	905	
15. Sandstones, red, flaggy, and shales, red; all poorly exposed	165	1070	
16. Shale, red	70	1140	
17. **Sandstone, Clayton?,** red	10	1150	
18. Shale, red	60	1210	
19. **Sandstone, Graham?,** red, shaly	10	1220	480
20. Shale, red	10	1230	
21. **Sandstone, Bertha?,** reddish-brown, flaggy	25	1255	
22. Shale, red, and concealed to level of Arnold White's gate (3010' B.)	25	1280	
23. **Sandstone, Bradshaw?,** greenish-gray, flaggy, cliff rock	45	1325	
24. Shale, red, partly concealed	95	1420	
25. **Sandstone, Droop,** green, thick-bedded, hard, medium-coarse (2845' B.); makes cliff on both sides of Dry Fork Valley	25	1445	225
26. **Shale, Talcott,** red, with streaks of dark, carbonaceous limestone	10	1455	
27. **Shale, Ada,** green, fissile, calcareous, with marine fossils; brachiopods, gastropods, crinoids, fish tooth, etc.	48	1503	
28. **Limestone, Reynolds,** shaly, with marine			

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
fossils (2785' B.); brachiopods (Orthotetes, Composita, Spirifer pellaensis), crinoids, etc.	2	1505	
29. Shale, Bickett, red	5	1510	
30. Sandstone, Webster Springs, greenish-brown, shaly; this rock is only 5' thick in road but in face of mountain due west of Job it is	30	1540	95
31. Shale, red	40	1580	
32. Limestone, Glenray, mostly concealed but represented by boulders with marine fossils; crinoids, etc.	20	1600	
33. Shale, Lillydale, red and green, calcareous, with marine fossil fragments (2670' B.)	20	1620	80
Greenbrier Series (100'+)			
34. Limestone, Alderson, partly concealed, dark, weathering yellow, partly shaly, with marine fossils; brachiopods (Composita, Spirifer), crinoids (Pterotocrinus, etc.), bryozoa (Archimedes), to Dry Fork at Job (2570' B.)	100	1720	

Whitmer Section.

Dry Fork District; starting on a spur of Allegheny Mountain 1.5 miles northeast of Gandy and first extending one mile due southward to a secondary road near the principal forks of a branch of Gandy Creek 1.4 miles eastward from Gandy; thence offsetting 0.7 mile southwestward along the same road and continuing about 0.1 mile southeastward along the main Gandy Creek road to intersection with above-mentioned branch of creek 0.5 mile north of Whitmer; dip northwest about 10°; upper portion measured with aneroid by David B. Reger, almost along strike, with correction for dip; lower portion estimated from vertical angles and distances; arrangement in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Mauch Chunk Series—Princeton Conglomerate (25')			
1. Sandstone, Princeton, greenish-brown, massive, coarse, with a three-foot zone of conglomerate at base (4020' B.); pebbles are white quartz, shale, and limestone	25	25	25
Mauch Chunk Series—Hinton Group (605')			
2. Shale, red, partly concealed	30	55	
3. Sandstone, Falls Mills, green, thin-bedded, hard, cliff rock (3950' B.)	40	95	70
4. Shale, red, partly concealed	515	610	
5. Sandstone, Stony Gap, greenish-brown, thick-bedded (3440' B.); lower part makes cliff and shoulder along mountain	20	630	535
Mauch Chunk Series—Bluefield Group (275')			
6. Shale, red, partly concealed	70	700	

	Thick-ness. Feet.	Total. Feet.	Inter-vals. Feet.
7. Sandstone, Droop, green, thin-bedded, hard, cliff rock (3355′ B.)	25	725	95
8. Concealed	45	770	
9. Sandstone, Webster Springs, greenish-red, flaggy, poorly exposed	5	775	50
10. Shale, red, largely concealed	45	820	
11. Limestone, Glenray, gray, tinged with pink, hard and fairly pure, with marine fossils; crinoids	45	865	
12. Concealed, with dark-red shale, Lillydale Shale	35	900	
13. Sandstone, Edray, green, flaggy (3195′ B.)	5	905	130
Greenbrier Series (300′)			
14. Limestone, Alderson, partly dark, partly gray, and oolitic	85	990	
15. Limestone, Union, (Gasper portion), gray, weathering white, hard, pure and oolitic (3545′ B.), with marine fossils; crinoids. Sample No. 714R, land of Ed. Lukens	85	1075	
16. Limestone, Union, (Bethel Sandstone stage); red, calcareous sandstone	15	1090	185
17. Limestone, Union, (Fredonia portion), gray, hard, siliceous, slightly oolitic	25	1115	
18. Limestone, Union, (Fredonia portion), red, sandy, impure	10	1125	
19. Limestone, Union, (Fredonia portion), gray, hard, pure, upper part poorly exposed; extends down to top of Pocono at secondary road (2940′ B.). Sample No. 715R, land of Ed. Lukens	80	1205	115
(Thence offsetting southwestward along this road 0.7 mile to top of bluff above Gandy Creek):			
Pocono Series (120′)			
20. Sandstone, Broad Ford, reddish-brown, thick-bedded, hard	20	1225	
21. Shale, greenish-gray	10	1235	
22. Sandstone, Broad Ford (continued), greenish-gray, hard, cross-bedded	20	1255	
23. Shale, green	15	1270	
24. Sandstone, Broad Ford (continued), green, thick-bedded, hard	10	1280	75
25. Shale, Sunbury, dark-green, sandy	40	1320	
26. Sandstone, Berea?, gray	5	1325	45
Catskill Series (______)			
27. Shale, red, not measured, exposed at branch of Gandy Creek southeast of road fork	--	----	

Osceola Section.

Dry Fork District; starting at the top of Yokum Knob at the northeastern end of the big sink just west of the village; dip northwest, being slight near top of knob but increasing toward Osceola; measured mainly with aneroid, corrected for dip, and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Mauch Chunk Series—Hinton Group (100′+)			
1. Concealed from top of knob	20	20	
2. Sandstone, Stony Gap, reddish-brown, flaggy, and shaly, partly concealed (4200′ B.)	80	100	100
Mauch Chunk Series—Bluefield Group (485′)			
3. Shale, red, partly concealed	250	350	
4. Sandstone, Droop, greenish-brown, flaggy, poorly exposed (3930′ B.)	30	380	280
5. Concealed and red shale	160	540	
6. Limestone, Glenray, pinkish-gray, pure, with marine fossils; abundant crinoids, also cup corals and blastoids (Archimedes)	15	555	
7. Shale, Lillydale, mostly concealed, partly red (3740′ B.)	30	585	205
Greenbrier Series (315′)			
8. Limestone, Alderson, dark, impure, with marine fossils; brachiopods; only partly exposed	25	610	
9. Limestone, Union, (Gasper portion), gray, weathering white, pure, oolitic, with marine fossils (3620′ B.); crinoids, cup corals, blastoids? (Pentremites?). Sample No. 717R, land of Bruce Yokum	110	720	
10. Concealed	20	740	
11. Sandstone, reddish-brown, calcareous, with red shale ----25′ 12. Limestone, gray ------10 13. Sandstone, green, calcareous --------25 } Union Limestone (Bethel Sandstone stage)	60	800	215
14. Limestone, Union, (Fredonia portion), gray, pure, with marine fossils; crinoids, cup corals; makes big sink. Sample No. 716R, land of Bruce Yokum	100	900	100
Maccrady Series (15′)			
15. Shale, red, visible along road west of Osceola	15	915	
Pocono Series (------)			
16. Sandstone, conglomerate, probably Broad Ford, not measured	--	---	

The following section indicates the nature of the rocks which cover and preserve Spruce Knob, Pendleton County, the highest mountain of the State. This mountain apparently is the most southeastern remnant of Pennsylvanian rocks in West Virginia and hence the nature of the Upper Raleigh (Sharon) Sandstone and its varied assemblage of pebbles is of unusual scientific interest. Much time could be spent with profit in deciphering the source history of these heterogeneous materials:

Spruce Knob Section.

Circleville District, Pendleton County; starting at the summit of Spruce Knob and extending southward about one-third mile to the head of Lick Run; measured with aneroid, approximately along the strike, and arranged in descending stratigraphic order by David B. Reger.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Pottsville Series—New River Group (45'+)			
1. **Sandstone, Upper Raleigh (Sharon),** gray, mainly conglomeratic with pebbles of white quartz, red jasper, mottled red and white intrusives, greenstone, and gray chert, with a few plant stems (4815' B.); covers top of Spruce Knob	45	45	45
Mauch Chunk Series—Bluestone Group (20')			
2. Shale, red and green, poorly exposed, with plant stems, worm trails and marine fossils. **Lot 442;** contains **Bornia radiata,** megaspore, and worm trail (across impression of a plant) according to David White	20	65	
Mauch Chunk Series—Princeton Conglomerate (45')			
3. **Sandstone, Princeton,** greenish-gray, massive, coarse, partly concealed, with inclusions of black iron crystals and with shaly conglomerate (4750' B.); numerous plant stems. **Lot 444;** contains **Bornia radiata (Asterocalamites scrobiculatus,)** according to David White	45	110	65
Mauch Chunk Series—Hinton Group (425')			
4. Shale, red, partly concealed, with very little sandstone, to level of railroad at Camp 2 (4425' B.)	325	435	
5. **Sandstone, Stony Gap?,** green, massive, cliff rock, with a few included coal spars (4325' B.); visible in bluff beneath railroad	100	535	425

SUMMARY OF MEASURED SECTIONS.

For convenient reference the thickness of the exposed stratified rocks of Randolph County, as determined by the measured sections of this Chapter, is compiled in the following tables, showing not only the thickness of the various series but also the totals for the different grand divisions, or periods, down to the lowest depths to which there are exposures or borings. A line of dots (........) under a series indicates that it was not exposed or in some cases not examined, where the section was measured. A question mark (?) indicates that the series was present and was examined but could not be differentiated from the one overlying or the one below it. A plus mark (+) indicates that only a portion of the full series or period is included in the section. In some few cases a section shows a thickness of a series either too great or too small, owing to the dip of the strata where it was made, a reduction to true vertical measurement being impracticable in some of the Pennsylvanian sections. As far as possible, however, such places were avoided. In all localities where the rocks dip steeply, particularly in the Devonian, all sections were reduced to true vertical measurement and so published. An explanation accompanies each section, where published in the text, detailing the conditions under which it was made:

Table Showing Thickness of Stratified Rocks in Measured Sections of Randolph County, in Feet.

PLACE MEASURED	PENNSYLVANIAN					
			Pottsville			
	Cone-maugh	Alle-gheny	Kana-wha	New River	Total	Total
Adolph			496+	360+	856+	856+
Aggregates				154+	154+	154+
Arvondale Junction		70+	612	453	1135	1135+
Bemis			655	321	976	976+
Beverly				50+	50+	50+
Bickle Knob				428+	428+	428+
Big Laurel Thicket			515+	25+	540+	540+
Bowden			295+	325	620+	620+
Cassity			544	372	916	916+
Cassity Fork			336+		336+	336+
Cheat Bridge			403+	284	687	687+
Cheat Junction			405+	370	775+	775+
Collett Gap				15+	15+	15+
Cromer Top						
Czar			445+		445+	445+
Dry Fork						
Durbin						
Elkhorn School						
Elklick						
Elk Mountain				460+	460+	460+
Evenwood						
Findley		175+	280+		280+	455+
Gage		142+	344+		344+	486+
Haines Knob				290+	290+	290+
Harding		110+	116+		116+	226+
Harman						
Hartridge			420+	223	643+	643+
Hazelwood			?	?	370+	370+
Helvetia			355+	180+	535+	535+
Hopkins			215	270	485+	485+
Jenningston						
Job Knob				262+	262+	262+
Kelley Mountain						
Laneville		150+	180	345	525	675+
Laurel		48+	181+		181+	229+
Laurel Br. of Middle Fk.			450+	368	818+	818+
Laurel Ridge			?	?	505	505+
Leiter		160+	115+		115+	275+
Lick Run of Middle Fk.			?	?	705+	705+
Little Stonecoal R. of Red Cr.		150+	320	270	590	740+
Lost Run of Middle Fk.			?	?	795+	795+
Mill Creek			110+	355	465+	465+
Mingo				270+	270+	270+
Morgantown Pike						
Norton		87+	404	208	612	699+
Osceola						
Otter Creek			350	270	620	620+
Pumpkintown		75+	342+		342+	417+
Red Creek	?	?	215	290	505	780+
Roaring Run						
Silica			580+		580+	580+
Slaty Fork				500+	500+	500+
Snyder Knob				120+	120+	120+
Spruce Knob				45+	45+	45+
Stonecoal R. of Red Cr.	79+	111	155	335	490	680+
Three Forks of Gauley			200+	530	730+	730+
Trout Run			550+		550+	550+
Valley Head			205+	356	561+	561+
Webster Springs			491+	267	758+	758+
Whitaker Falls				675	675+	675+
Whitmer						

Table Showing Thickness of Stratified Rocks in Measured Sections of Randolph County, in Feet (Continued).

PLACE MEASURED	MISSISSIPPIAN								
	Mauch Chunk								
	Blue-stone	Prince-ton	Hinton	Blue-field	Total	Green-brier	Maccrady	Pocono	Total
Adolph	......	......	......	......	......	......	....	......	......
Aggregates	23	28	163	187	401	181	0	70	652
Arvondale Junction	?	?	?	?	671	60	0	61	792
Bemis	0	50	405+	......	455+	......	....	......	455+
Beverly	?	?	?	247	402	115	0	0	517
Bickle Knob	?	?	255	530	820	240	0	95	1155+
Big Laurel Thicket	......	......	......	......	......	......	....	......	......
Bowden	130	25	?	?	710	115+	....	......	825+
Cassity	61	43	15+	......	119+	......	....	......	119+
Cassity Fork	......	......	......	......	......	......	....	......	......
Cheat Bridge	?	?	?	......	169+	......	....	......	169+
Cheat Junction	0	0	158+	......	158+	......	....	......	158+
Collett Gap	285	40	400	197	922	209	0	......	1131+
Cromer Top	?	?	?	605	1120+	115	0	40	1275+
Czar	......	......	......	......	......	......	....	......	......
Dry Fork	......	......	......	......	......	......	0	185	185+
Durbin	?	?	?	420	1085	220	80	120	1505
Elkhorn School	......	......	......	245+	245+	205	0	0	450+
Elklick	......	......	......	......	......	285	0	85	370+
Elk Mountain	150	25	?	?	1610	......	....	......	1610+
Evenwood	......	......	......	131+	131+	231	0	60	424+
Findley	......	......	......	......	......	......	....	......	......
Gage	......	......	......	......	......	......	....	......	......
Haines Knob	325	25	?	?	1330	100+	....	......	1430+
Harding	......	......	......	......	......	......	....	......	......
Harman	......	......	......	45+	45+	340	0	10+	395+
Hartridge	16	20	6+	......	42+	......	....	......	42+
Hazelwood	?	?	?	?	1410	260	....	......	1670+
Helvetia	......	......	......	......	......	......	....	......	......
Hopkins	?	?	?	......	415+	......	....	......	415+
Jenningston	......	......	......	......	......	......	....	......	......
Job Knob	?	?	?	475	1185	115+	....	......	1300+
Kelley Mountain	......	......	......	......	......	......	....	......	......
Laneville	?	?	?	?	900	365	0	50+	1315+
Laurel	......	......	......	......	......	......	....	......	......
Laurel Br. of Middle Fk.	48	59	......	......	107+	......	....	......	107+
Laurel Ridge	?	?	......	......	35+	......	....	......	35+
Leiter	......	......	......	......	......	......	....	......	......
Lick Run of Middle Fork	......	......	......	......	......	......	....	......	......
Little Stonecoal R. of Red Cr.	145	85	200+	......	430+	......	....	......	430+
Lost Run of Middle Fork	25+	......	......	......	25+	......	....	......	25+
Mill Creek	......	......	......	......	......	......	....	......	......
Mingo	170	80	320	135	1005	330	15	220	1570
Morgantown Pike	......	......	......	......	......	0	0	111	111+
Norton	......	......	......	......	......	......	....	......	......
Osceola	......	......	100+	485	585	315	15	......	915
Otter Creek	35	15	?	?	640	140+	....	......	780+
Pumpkintown	......	......	......	......	......	......	....	......	......
Red Creek	10	45	170+	......	225+	......	....	......	225+
Roaring Run	......	......	......	......	......	......	....	......	......
Silica	......	......	......	......	......	......	....	......	......
Slaty Fork	100	50	415	825	1380	10+	....	......	1390+
Snyder Knob	?	?	?	620	1245	407	20	120	1792
Spruce Knob	20	45	425	......	490+	......	....	......	490+
Stonecoal R. of Red Cr.	175	15	110+	......	300+	......	....	......	300+
Three Forks of Gauley	35	145	......	......	180+	......	....	......	180+
Trout Run	......	......	......	......	......	......	....	......	......
Valley Head	5	15	288	445	753	286	....	50	1089
Webster Springs	77	28	182	593+	880+	......	....	......	880+
Whitaker Falls	?	?	?	675	1145	......	....	......	1145+
Whitmer	......	25	605	275	905+	300	0	120	1325+

Table Showing Thickness of Stratified Rocks in Measured Sections of Randolph County, in Feet (Concluded).

PLACE MEASURED	DEVONIAN					Total Section
	Catskill	Chemung	Portage	Genesee	Total	
Adolph						856
Aggregates	774	3147+			3921+	4727
Arvondale Junction	673	2874+			3547	5474
Bemis						1431
Beverly	470	2818			3288+	3955
Bickle Knob	270+				270+	1853
Big Laurel Thicket						540
Bowden						1445
Cassity						1035
Cassity Fork						336
Cheat Bridge						856
Cheat Junction						933
Collett Gap						1146
Cromer Top	760				760+	2035
Czar						445
Dry Fork	380+				380+	565
Durbin	630				630+	2135
Elkhorn School	100+				100+	550
Elklick	320+				320+	690
Elk Mountain						2070
Evenwood	1025	570+			1595+	2019
Findley						455
Gage						486
Haines Knob						1720
Harding						226
Harman						395
Hartridge						685
Hazelwood						2040
Helvetia						535
Hopkins						900
Jenningston	800+				800+	800
Job Knob						1562
Kelley Mountain		2000+			2000+	2000
Laneville						1990
Laurel						229
Laurel Br. of Middle Fk.						925
Laurel Ridge						540
Leiter						275
Lick Run of Middle Fk.						705
Little Stonecoal R. of Red Cr.						1170
Lost Run of Middle Fk.						820
Mill Creek						465
Mingo	140+				140+	1980
Morgantown Pike	515	20+			535+	646
Norton						699
Osceola						915
Otter Creek						1400
Pumpkintown						417
Red Creek						1005
Roaring Run	40+	267+			307+	307
Silica						580
Slaty Fork						1890
Snyder Knob						1912
Spruce Knob						535
Stonecoal R. of Red Cr.						980
Three Forks of Gauley						910
Trout Run						550
Valley Head	635	525+			1160+	2810
Webster Springs						1638
Whitaker Falls						1820
Whitmer						1325

CHAPTER VI.

STRATIGRAPHY—PENNSYLVANIAN ROCKS.

INTRODUCTION.

The Pennsylvanian System of rocks forms the uppermost grand division of stratified beds in Randolph County, being succeeded only by certain terrace gravels and river clays of Pleistocene age. The Pennsylvanian probably once covered all of the county but any estimate of its original thickness would be conjectural, although it is probable that most of its subdivisions, as known in adjacent counties to the north and west, may have been formed in this area and later removed by erosion. The principal present areas are in the western part of the county west of Rich Mountain and farther south in the Point Mountain, Elk and Gauley country; in the North Potomac (Georges Creek) Basin making a northeast-southwest belt through the central part of the country; and in the synclinal territory of the northeastern corner of the country along portions of the Job and Stony River Basins southward from Laneville.

The subdivisions now remaining, and as classified in descending stratigraphic order, are as follows:

	Feet.
Conemaugh Series	50 to 400
Allegheny Series	100 to 250
Pottsville Series:	
Kanawha Group	350 to 675
New River Group	150 to 400
Apparent maximum	1,725

The various series are composed of sandstones, sandy or fire clay shales, carbonaceous shales, lenticular and siliceous limestones all of which are very thin, and coals.

CONEMAUGH SERIES.

GENERAL ACCOUNT AND SECTION, CONEMAUGH SERIES.

The Conemaugh Series of the Pennsylvanian Period comprises only a small portion of the surface rocks of Randolph County. As shown on Map II there are a few scattered areas in the northwestern corner of the county, principally along the Belington Syncline in the Roaring Creek Valley, the thickness in this territory being seldom more than 50 feet. In the northeastern part of the county it is preserved again with much greater thickness in the Roaring Plains and Flatrock Plains along the Stony River Syncline south of Laneville.

This series, in general, is comprised of gray or brown sandstones, sandy, red, or fire clay shales, thin limestones some of which are of marine and some of non-marine character, and coals.

In the western part of the county the series, before erosion began, was probably very similar to its appearance in the adjacent areas of Barbour and Upshur Counties where it is more fully preserved.

In the General Section of the Conemaugh, as published by the writer in the Barbour, Upshur and Western Randolph Report, pages 202-203, it is evident that the lower part is principally composed of the following beds:

	Feet.
Sandstone, Upper Mahoning, gray, massive, often pebbly	30
Coal, Mahoning, not persistent	0 to 1
Fire clay, Thornton, lenticular	0 to 5
Sandstone, Lower Mahoning, gray, massive, often pebbly	45
Shale, Uffington, dark, sandy, with plant fossils	5
Coal, Upper Freeport (Top of Allegheny Series)	--

Very little of the series is left in this portion of the county except the Lower Mahoning Sandstone and Uffington Shale. Good exposures of these formations were not noted and hence description and further comment are not made.

In the Laneville territory of the northeastern corner of the county the Conemaugh exposures occur in a mountain wilderness where natural exposures are extremely poor and where no borings have been made except on the Tucker County side of the line where there have been certain diamond drill holes as previously published in the Report on that county. On the Randolph County side of the line no attempt was made to measure the Conemaugh in the Roaring Plains and Flatrock Plains where it occurs but from the position of the Sewell and other coals farther down it is evident that there must be 400 feet or more of the series left covering two or three square miles of territory in these high ridges.

The following general section, prepared by the writer and published in the Tucker County Report of the Survey, pages 149-151, represents the Conemaugh Series as it appears where exposures are good or where it is recorded in reliable borings in the Thomas and Fairfax Knob regions of Tucker

County about 20 miles north of the Laneville region. Its lower portion should be closely applicable to the northeastern corner of Randolph:

General Section of the Conemaugh Series for Tucker County. (Probably applicable to Northeastern Randolph).

		Thickness. Feet.	Total. Feet.
	Coal, Pittsburgh, basal member of Monongahela Series	--	--
1.	Fire clay and shale	5	5
2.	Limestone, Fairfax	2	7
3.	Shale	3	10
4.	Coal, Morantown	4 to 5	15
5.	Concealed, containing shales	35	50
6.	Sandstone, Lower Pittsburgh, gray	10 to 20	70
7.	Shale, dark, horizon of Upper Pittsburgh Limestone	4	74
8.	Coal, Little Pittsburgh, multiple-bedded	6	80
9.	Concealed and sandy shales, horizon of Lower Pittsburgh Limestone and Connellsville Sandstone	30	110
10.	Shales, sandy and dark, may contain Franklin "Rider" Coal of Maryland	8½	118½
11.	Coal, Little Clarksburg (Franklin of Maryland?), double-bedded	1½	120
12.	Shale, gray, and concealed, horizon of Lower Connellsville (Hoffman of Maryland) Sandstone	24	144
13.	Coal, Normantown (Upper Hoffman of Maryland)	1	145
14.	Shale, dark, sandy	23	168
15.	Coal, Middle Hoffman, double-bedded	2	170
16.	Shale, gray, calcareous	8	178
17.	Limestone, Hoffman, dark, siliceous, and carbonaceous, with fresh-water fossils	2	180
18.	Shale, dark, sandy, and concealed, horizon of Lower Hoffman Coal, Clarysville Sandstone, and Upper and Lower Clarysville Coals of Maryland	70	250
19.	Sandstone, Morgantown?	30	280
20.	Shale, variegated, horizon of Wellersburg "Rider" Coal, Wellersburg Coal, and Barton "Rider" Coal of Maryland	109	389
21.	Sandstone, Barton. lenticular	0 to 20	409
22.	Coal, Elk Lick (Barton, "Four-foot" of Maryland?)	1	410
23.	Shale, Birmingham, red and variegated, horizon of Elk Lick Limestone (Barton of Maryland) and West Milford Coal	20 to 50	460
24.	Sandstone, Upper Grafton (of Maryland)	10 to 20	480
25.	Shale, variegated, horizon of Federal Hill Coal (of Maryland)	8	488
26.	Sandstone, Grafton, massive	20	508

		Thickness. Feet.	Total. Feet.
27.	**Shale, Ames,** dark-green, with marine fossils (sometimes split into two benches by **Harlem "Rider" Coal** farther east in Maryland)	10	518
28.	**Coal, Harlem**	1 to 2	520
29.	Shale, red and variegated	10	530
30.	**Limestone, Ewing**	0 to 5	535
31.	**Shale, Pittsburgh (upper bench),** red and variegated	30	565
32.	**Sandstone, Jane Lew,** massive	20	585
33.	**Shale, Pittsburgh (lower bench),** red and variegated	27	612
34.	**Sandstone, Saltsburg,** massive	20	632
35.	Shale, sandy	10	642
36.	**Coal, Bakerstown (Thomas)**	3 to 8	650
37.	**Limestone, Albright,** lenticular	0 to 2	652
38.	Shale, sandy or red	15	667
39.	**Limestone, Pine Creek (Cambridge** of Maryland Survey), lenticular, siliceous, normally carrying marine fossils; none found in Tucker County	0 to 3	670
40.	**Shale, Meyersdale,** red	10 to 5	675
41.	**Sandstone, Buffalo,** massive, often conglomeratic	30	705
42.	**Shale and limestone, Brush Creek,** with marine fossils	8	713
43.	**Coal, Brush Creek**	1 to 2	715
44.	**Fire clay** shale	10	725
45.	**Sandstone, Upper Mahoning,** massive	20 to 35	760
46.	**Limestone, Sutton,** lenticular	0 to 3	763
47.	**Shale, Mahoning,** red	0 to 5	768
48.	**Coal, Mahoning,** lenticular	0 to 2	770
49.	**Fire clay, Thornton,** or sandy shale	10	780
50.	**Sandstone, Lower Mahoning,** massive, often conglomeratic	20 to 35	815
51.	**Shale, Uffington,** dark	5 to 25	840
	Coal, Upper Freeport (Davis), (Top member of Allegheny Series)	-- --	---

In the sections for Stonecoal Run of Red Creek, page 201, and for Red Creek, pages 203-4, the lower portion of the Conemaugh is revealed by borings as it exists on the Tucker County side of Red Creek in the Stony River Syncline northeast of Laneville. On the south side of Red Creek in the Roaring Plains and Flatrock Plains it is apparent from the structure that 400 feet or more, or approximately the lower half, of the series should be preserved. Aside from the general scientific interest attaching to these strata it is possible that the territory might hold some Bakerstown (Thomas) Coal of minable thickness. A considerable amount of expensive prospecting and possibly diamond drill boring would be required to determine the nature of this coal.

ALLEGHENY SERIES.

GENERAL ACCOUNT AND SECTION, ALLEGHENY SERIES.

The Allegheny Series of the Pennsylvanian Period is composed of gray, brown, and sometimes conglomeratic sandstones, sandy or carbonaceous shales, fire clays, and fire clay shales, thin and siliceous limestone, and coals. In its lithologic aspects it is distinguished from the Conemaugh Series above it by the complete absence of red shales, indicating that some rather fundamental climatic or erosional differences existed.

The following general section, prepared by the writer, shows the nature of this series in Randolph County, being partly compiled from information obtained in adjacent territory and from coal borings, as the outcrops in Randolph are much covered by wash and therefore poorly adapted to accurate stratigraphic study:

General Section of the Allegheny Series for Randolph County.

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
1.	Coal, Upper Freeport (Davis), multiple-bedded	3 to 8	8	8
2.	Shale, sandy, and fire clay, impure, Bolivar	5 to 7	15	
3.	Limestone, Upper Freeport, ferriferous, often absent	0 to 5	20	
4.	Sandstone, Upper Freeport, gray, massive	20 to 28	48	
5.	Coal, Lower Freeport, double-bedded, lenticular	0 to 2	50	42
6.	Fire clay and shale	2	52	
7.	Limestone, Lower Freeport, mostly ferriferous nodules mixed with plastic fire clay	2 to 6	58	
8.	Fire clay, Lower Freeport, flinty or plastic	5 to 2	60	
9.	Sandstone, Lower Freeport, gray and massive, or shaly	20 to 50	110	
10.	Coal, Upper Kittanning, soft, double-bedded	2 to 5	115	65
11.	Fire clay, Upper Kittanning, often shaly	0 to 5	120	
12.	Limestone, Johnstown, gray, shaly, lenticular	0 to 5	125	
13.	Fire clay, Hardman, generally impure	0 to 5	130	
14.	Sandstone, Upper East Lynn, gray, massive	50 to 35	165	
15.	Coal, Middle Kittanning, soft, multiple-bedded, often absent or closely associated with Lower Kittanning Coal	0 to 5	170	55

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
16.	Sandstone, East Lynn, gray, shaly, often represented by thin bed of shale	15 to 2	172	
17.	Coal, Lower Kittanning, soft, multiple-bedded, mined in conjunction with Middle Kittanning Coal in Roaring Creek region	3 to 8	180	10
18.	Fire clay, Lower Kittanning, usually represented by sandy shale	2 to 5	185	
19.	Shale, sandy	5 to 10	195	
20.	Sandstone, Kittanning, gray, massive, often absent	0 to 30	225	
21.	Coal, Clarion, double-bedded, often absent	0 to 5	230	50
22.	Shale, sandy	10 to 20	250	
	Sandstone, Homewood (Top of Pottsville Series)	--	--	---

The above section indicates the probable maximum thickness that existed in the western part of Randolph County before erosion began. In the Laneville country of northeastern Randolph, on the contrary, the series is little more than 100 feet thick, as proved by borings in the adjacent area of Tucker County, and in harmony with its generally thin section in all of West Virginia east of Backbone Mountain.

SUBDIVISIONS, ALLEGHENY SERIES.

Unlike the Pottsville and certain other series of rocks the Allegheny Series has not been subdivided into any major groups. Its individual members, however, as recorded in the general section on a previous page, are very distinct and can be traced with considerable regularity in adjacent counties where the exposures are more satisfactory than in Randolph.

TOPOGRAPHIC EXPRESSION, ALLEGHENY SERIES.

In regions where a sufficient amount of the Allegheny Series is present to afford good observation and where it covers the landscape without the protecting cover of another series, its topography is characterized by comparatively gentle ridge forms, the tops being fairly broad and the slopes gently rounded. At the base a glady zone, held up by the underlying Pottsville, is not uncommon. Bold cliffs and rugged promontories or peaks are seldom seen. The territory along the paved road from Norton southward to Coalton and Mabie is a good example of its topography.

AREAL EXTENT, ALLEGHENY SERIES.

As shown by Map II and by Figure 6, the Allegheny covers a considerable area along the Belington Syncline in

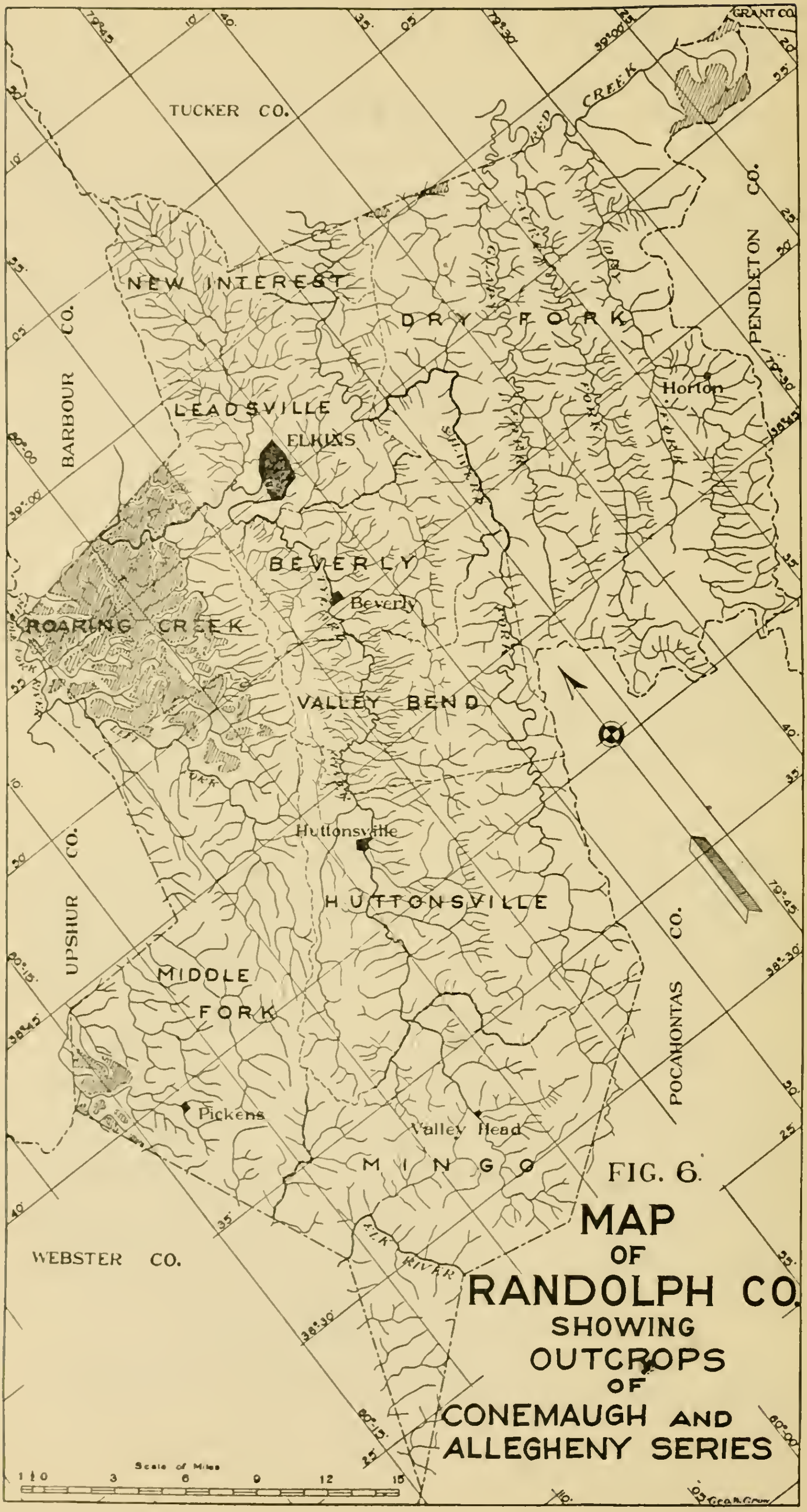

FIG. 6.

MAP OF RANDOLPH CO. SHOWING OUTCROPS OF CONEMAUGH AND ALLEGHENY SERIES

Roaring Creek District and in the northern edge of Middle Fork District. It also covers a much less extensive territory in the extreme northeastern corner of the county along the Stony River Syncline east and southeast of Laneville.

CONTACTS, ALLEGHENY SERIES.

The upper contact of the Allegheny Series with the overlying Conemaugh is poorly marked, being of a somewhat arbitrary nature. Above the Upper Freeport Coal, generally accepted as the top of the Allegheny, is the dark, sandy Uffington Shale of the Conemaugh, although the latter is absent in many localities, allowing the Mahoning Sandstone to rest directly on the coal. The Uffington Shale is known to have few, if any, marine fossils and in this respect differs little from the shales of the Allegheny. It contains some plant life but apparently no great study of this has been made in the territory adjacent to Randolph County. The sandstones of the Conemaugh, in general, are much more feldspathic than are those of the Allegheny and it may be possible that a careful study of the comparative lithology would yield interesting results.

At the base of the Allegheny its gray sandstones and carbonaceous shales rest upon the great Homewood Sandstone of the Pottsville which is often white and nearly always conglomeratic. There is no essential lithologic difference in the shales above and below the contact zone but there is a very considerable change in the floras, or fossil plants.

CORRELATION, ALLEGHENY SERIES.

The name of Allegheny is almost universally applied in Pennsylvania, Maryland, West Virginia, and Ohio to the series of rocks described under this title in the present Report. Rocks of similar age are known to exist in the coal basin of Illinois, Indiana, and western Kentucky but it is not apparent that the details need be discussed in this local report.

DESCRIPTION OF MEMBERS, ALLEGHENY SERIES.

Upper Freeport (Davis) Coal.

The **Upper Freeport Coal** of the First Geological Survey of Pennsylvania, frequently known by the local names of "Davis" and "Split-six" in the North Potomac and Stony River Synclines of the Potomac region, forms the upper member of the Allegheny Series. In the territory of West Virginia west of Laurel Ridge and Rich Mountain the nomenclature of this coal has never been in doubt but in the Potomac region which is more applicable to the northeastern corner of Randolph County the name of Lower Kittanning was erroneously applied to the true Upper Freeport for many years and hence the parenthetic use of a local name, as discussed in the reports on Tucker and on Mineral and Grant Counties, appears essential.

In the western part of Randolph County the Upper Freeport Coal horizon is exposed in certain hilltops but so far as known no coal of any consequence is found where this seam should belong. In the Thomas and Davis region of Tucker County it has been mined extensively and in the region of the same county northeast of Laneville it was once locally mined and several borings have been made through it. In a limited portion of Randolph east and southeast of Laneville this coal should be present in some of the high mountains. Its discussion will therefore be reserved for Chapter X under the subject of "Commercial Coal."

Bolivar Fire Clay.

The **Bolivar Fire Clay,** which in more northern counties is sometimes found to underlie the Upper Freeport Coal, apparently has not been prospected in Randolph County and its thickness and quality are therefore unknown. In adjacent regions, however, it is usually sandy and often ferruginous and hence the presence of a good refractory clay at this horizon in Randolph County is doubtful. In the Stonecoal Run of Red Creek Section, page 202, a fire clay horizon 6′ 2″ thick, coming about 10 feet below the Upper Freeport (Davis) Coal, is reported in a boring in the edge of Tucker County. This bed probably represents the Bolivar but its quality is unknown and too much hope of finding it farther south in the Stony River Basin should not be entertained.

Upper Freeport Limestone.

The **Upper Freeport Limestone,** named by the First Geological Survey of Pennsylvania from its occurrence in the same locality as the Freeport Coals, was not observed in Randolph County and it is also generally absent in the adjacent portions of Upshur and Barbour. In Tucker County, however, it is present in the vicinity of Douglas and Coketon and also near Gatzmer on Beaver Creek several miles east of Davis. Around Laneville it was not noted but its presence a little farther north would indicate that its occurrence in the Stony River Basin of Randolph County is not improbable. Generally it is of fresh-water origin, rather siliceous, and only a few feet thick.

Upper Freeport Sandstone.

The **Upper Freeport Sandstone**, separated from the Upper Freeport Coal by the Bolivar Fire Clay and Upper Freeport Limestone, or by sandy shales when these members are absent, is a coarse, gray, massive stratum, usually 20 to 30 feet thick but often locally in excess of those figures. Few of the measured sections of western Randolph start above its horizon but it should be present in some of the hills west of Norton and Coalton. In the Stony River Basin it has previously been noted in the Little Stonecoal Run of Red Creek Section, page 200, its exposure being in the edge of Tucker County where it forms a pinnacle known as the "Big Rocks." So far as known it has not been quarried in the county but its massive and durable character would make it suitable for masonry structures.

Lower Freeport Coal.

The **Lower Freeport Coal**, of the First Geological Survey of Pennsylvania, belonging 45 to 50 feet below the Upper Freeport Coal and being usually double-bedded and often lenticular with a thickness of hardly more than two feet in adjacent counties, was not observed at outcrop in Randolph County. In the Stonecoal Run of Red Creek Section, page 202, it is recorded as 1′ 5″ thick and slaty, as it occurs in a boring in Tucker County just north of the Randolph line. From the evidence of this boring its presence in the Stony River Basin southeast of Laneville might be anticipated but there is little likelihood that it would have commercial thickness.

Lower Freeport Limestone.

The **Lower Freeport Limestone** of Pennsylvania, belonging only a few feet below the Lower Freeport Coal, was not observed at outcrop in Randolph County and is not recorded in borings so far as known. In the Belington Basin of Barbour County, however, it has been found at various points and it has also been noted in Tucker County near Douglas, and its presence in some of the Allegheny beds of Randolph is not improbable. Generally it occurs as ferriferous nodules bedded in plastic clay and carries no marine fossils so that it has little scientific or economic importance.

Lower Freeport Fire Clay.

The **Lower Freeport Fire Clay** of Reger[1], coming just

[1]David B. Reger, Tucker County Report, W. Va. Geol. Survey, pp. 184-185; 1923.

under the Lower Freeport Limestone and just over the Lower Freeport Sandstone in the vicinity of Douglas, Tucker County, was not observed at outcrop in Randolph County. At Douglas it is flinty and partly plastic and of a semirefractory nature. It may or may not occur in the Stony River Basin southeast of Laneville but the borings immediately to the northward in the edge of Tucker do not report it and attempts to find it would probably be unprofitable.

Lower Freeport Sandstone.

The **Lower Freeport Sandstone,** coming between the Lower Freeport Fire Clay and Upper Kittanning Coal, may usually be found in the region where its horizon outcrops. Generally it is gray and massive with occasional quartz pebbles and with a thickness of 20 to 50 feet. In Chapter V it is recorded in the sections for Findley, Leiter, Little Stonecoal Run of Red Creek, Stonecoal Run of Red Creek, and Red Creek. It is generally hard and durable and could furnish a great amount of stone for masonry structures.

Upper Kittanning Coal.

The **Upper Kittanning Coal,** named by Platt and Lesley from its occurrence in Pennsylvania, and belonging 100 to 120 feet below the Upper Freeport Coal in western Randolph, has been prospected at various points and is known to be of considerable value. Its further discussion will therefore be reserved for the subject of "Commercial Coal" in Chapter X. Its outcrop is shown on Map II and its areal extent is indicated on Figure 17.

Upper Kittanning Fire Clay.

The **Upper Kittanning Fire Clay** of Hennen[2], coming just under the Upper Kittanning Coal and just above the Johnstown Limestone, was not observed at outcrop in Randolph County and the few borings which have pierced its horizon generally record it as sandy shale. There is therefore little evidence on which to base a conclusion as to its possible merits.

Johnstown Limestone.

The **Johnstown Limestone,** belonging a few feet below the Upper Kittanning Coal and just between the Upper Kittanning and Hardman Fire Clays, was not noted in Randolph although it is present in adjacent portions of Tucker,

[2]Ray V. Hennen, Monongalia-Marion-Taylor Rept., W. Va. Geol. Survey, p. 344; 1913.

Barbour, and Upshur Counties. If it occurs at all in Randolph it would undoubtedly be siliceous and lenticular and of small economic value. So far as known it carries no marine fossils at any point in the State.

Hardman Fire Clay.

The **Hardman Fire Clay** of Hennen[3], belonging just under the Johnstown Limestone, was not observed at outcrop in Randolph County and so far as known makes a poor showing in the few borings which have pierced its horizon. Apparently it is plastic and impure and it is not evident that prospecting for it would be profitable.

Upper East Lynn Sandstone.

The **Upper East Lynn Sandstone** of Hennen[4] has been defined as occupying most of the interval between the Upper Kittanning Coal and Middle Kittanning Coal. Under such an interpretation it is therefore necessary to conclude that the sandstone bed classified as "East Lynn" by the writer in the earlier report on Barbour, Upshur and the Western Portion of Randolph, pages 255-260, should now be called the Upper East Lynn in most cases as it rather clearly overlies both the Middle and Lower Kittanning Coals in Randolph County and generally the true East Lynn which comes between them is absent by unconformity, although the parting between the coals soon develops into a sandstone westward in Upshur County.

The Upper East Lynn, as so revised, is generally gray, massive, and 30 to 50 feet thick. It is nearly always present just above the draw slate which covers the combined Middle and Lower Kittanning Coals in the Roaring Creek region. On the ridge one-half mile north of Pumpkintown it is a massive, pebbly formation, having an elevation of 2470′ B. On the head of Big Laurel Run, one mile northeast of Pumpkintown, it makes a cliff 30 feet thick with an elevation of 2365′ B. One mile east of Kingsville it is 30 feet thick and pebbly, the elevation of its top being 2250′ B. One-half mile northeast of Coalton it makes a cliff 20 feet thick, the elevation of its top being 2270′ B. In the region west of Norton it makes numerous exposures. On the head of Kettle Run 1.2 miles southwest of Pumpkintown, it is a massive cliff, 25 feet thick, at an elevation of 2265′ B. In all this region there

[3]Ray V. Hennen, Monongalia-Marion-Taylor Rept., W. Va. Geol. Survey, p. 347; 1913.

[4]Ray V. Hennen, Braxton-Clay Rept., W. Va. Geol. Survey, pp. 237-240; 1917.

are many localities where this stone could be quarried to good advantage for masonry structures.

In the Stony River Basin near Laneville it is not apparent that the Upper East Lynn Sandstone is present in any considerable quantity, as it is almost totally absent farther north at Thomas and Douglas where the total Allegheny Series is only 150 feet thick and there is no evidence that any thickening has occurred southward toward Laneville.

Middle Kittanning Coal.

The **Middle Kittanning Coal** of Pennsylvania, coming almost immediately below the Upper East Lynn Sandstone and 0 to 50 feet above the Lower Kittanning Coal, is an irregular deposit, being sometimes combined with the latter seam so that both are mined in the same opening with only a barely perceptible parting between them, and at other times sufficiently separated that it can be mined as a distinct bed. In a considerable portion of the Belington Basin of western Randolph County, the interval between the two coals is so small that their delineation as separate beds is impracticable and hence they are both described together in Chapter X under the subject of "Commercial Coal."

East Lynn Sandstone.

The **East Lynn Sandstone** of Krebs[5], coming between the Middle and Lower Kittanning Coals, is almost completely absent in Randolph County both in the Belington and Stony River Basins. Farther west in Upshur County it makes its appearance and may be traced through many counties to the southwestward.

Lower Kittanning Coal.

The **Lower Kittanning Coal,** named by J. P. Lesley from its occurrence in Armstrong County, Pennsylvania, is the principal minable coal of the Allegheny Series in Randolph County, being 175 to 190 feet below the top of the series in the western part of the county and 15 to 50 feet above the top of the Homewood Sandstone. Its chemical character, bed-section, distribution, and quantity will be discussed in Chapter X under the subject of "Commercial Coal." Its outcrop is shown on Map II and its supposed minable extent on Figure 18.

Lower Kittanning Fire Clay.

The **Lower Kittanning Fire Clay,** belonging just under

[5]C. E. Krebs, Cabell-Wayne-Lincoln Rept., W. Va. Geol. Survey, p. 183; 1913.

the Lower Kittanning Coal, has not been recognized in pure form in Randolph County although it appears to be present at certain localities to the westward in Upshur County and to the northeastward in Tucker. In Randolph its horizon appears to be represented by a sandy shale, five to ten feet thick and too impure to be considered for refractory purposes.

Kittanning Sandstone.

The **Kittanning Sandstone,** belonging just over the Clarion Coal when this lower portion of the Allegheny Series is not absent by unconformity, is apparently represented in a portion of the Belington Basin of western Randolph. In the Findley Section, page 128, it is recorded as partly visible just below the Lower Kittanning Coal. Generally it is gray and massive and seldom exceeds 25 or 30 feet in thickness. Quite frequently it is entirely absent.

Clarion Coal.

The **Clarion Coal** of Pennsylvania, coming next under the Kittanning Sandstone and seldom more than 20 feet above the top of the Homewood Sandstone, is present in some of the hills in the northern edge of Randolph County next to Barbour and has been mined at one or two localities. It will therefore be more fully described in Chapter X under the subject of "Commercial Coal." Figure 19 shows its supposed minable extent.

ECONOMIC ASPECTS, ALLEGHENY SERIES.

From an economic standpoint the Allegheny Series has been of great importance to Randolph County on account of the commercial coal which it contains and which has long been mined in the Roaring Creek Valley and in the region to the northward. Otherwise the series has furnished little that is of present economic importance. Its fire clays are too thin and impure for satisfactory development and limestones and iron ore are almost totally absent, although it contains these materials in certain other counties. Its sandstones offer abundant material for masonry structures but little use has been made of them.

POTTSVILLE SERIES.

GENERAL ACCOUNT AND SECTION, POTTSVILLE SERIES.

The Pottsville Series of the Pennsylvanian, coming at the base of this period and lying just over the red shales of the Mauch Chunk Series, covers a very considerable portion of Randolph County. It is well known that this series thickens greatly from northeast to southwest across the State, being only about 350 feet in Mineral County along the Maryland State line but increasing to a maximum of about 3850 feet in McDowell and adjacent counties next to Virginia and Kentucky. In Randolph its development is an intermediate phase, the thickness at the northern end being about 550 feet, but increasing to 1075 feet in the Elk and Gauley country, if sufficient allowance be made for the upper members which have now been eroded.

The series consists of gray, coarse, massive or current-bedded sandstones, several ledges of which contain angular or slightly rounded pebbles of white quartz and of less abundant red jasper and darker silicates; sandy or carbonaceous shales usually carrying abundant plant fossils and less frequently fresh- or brackish-water faunas and still more rarely marine fossils; and coal seams, several of which are of commercial thickness and very pure. Bedded limestones are almost entirely unknown, there being occasional concretionary lentils in some of the shales. True fire clays, which occur in some abundance in the upper part of the series farther northeast, are practically absent.

The following general section, adapted in part from Reports on adjacent counties but thoroughly revised to fit the local situation, illustrates the character of the series in Randolph County:

General Section of the Pottsville Series for Randolph County.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Kanawha Group (350' to 675')			
1. Sandstone, Homewood, gray, massive or current-bedded, often pebbly, generally prominent west of Rich Mountain, also along lower waters of Otter Creek and on Cheat Mountain west of Bemis	25 to 60	60	
2. Fire Clay, Hammond, represented by sandy shales	5 to 15	75	
3. Coal, Upper Mercer, multiple-bedded, lenticular; occurs mostly west of Tygart Valley	0 to 5	80	80
4. Shales, dark or sandy, contain horizon of Kanawha Black Flint	5 to 21	101	
5. Coal, Lower Mercer (Stockton), often hard and splinty; occurs mostly west of Tygart Valley	0 to 4	105	25
6. Sandstone, Upper Connoquenessing, gray, massive, pebbly; outcrops generally in same region as Homewood	50 to 100	205	
7. Coal, Quakertown "Rider" (Coalburg?), lenticular, noted at Laurel Station on Tygart River	0 to 1	206	

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
8.	Shale, Quakertown, black, fissile; often carries Lingula kanawhensis and Naiadites elongata	0 to 11	217	
9.	Coal, Quakertown (Winifrede?), lenticular	0 to 3	220	115
10.	Sandstone, Lower Connoquenessing (Lower Winifrede?), gray, massive	20 to 35	255	
11.	Shale, sandy; probably represents horizon of Winifrede Limestone which carries Lingula fossils on Otter Creek, Tucker County	5 to 10	265	
12.	Sandstone, Upper Chilton, gray, massive	15 to 30	295	
13.	Shale, sandy	5 to 8	303	
14.	Coal, Chilton, seldom found	0 to 2	305	85
15.	Shale, sandy; probably contains horizon of Blackwater (Dingess?) Shale and Limestone which carries marine fossils on Blackwater River west of Davis, Tucker County	5 to 8	313	
16.	Sandstone, Upper Cedar Grove, gray, massive	20 to 25	338	
17.	Coal, Cedar Grove	0 to 2	340	35
18.	Shale, sandy	5 to 10	350	
19.	Sandstone, Peerless, gray, massive; same as Lower Cedar Grove of various Reports	10 to 48	398	
20.	Coal, Alma, medium-hard; mined near Pickens	0 to 2	400	60
21.	Shale, sandy	0 to 5	405	
22.	Sandstone, Monitor, gray, massive; same as "Logan Sandstone" of Logan-Mingo Report	0 to 22	427	
23.	Coal, Campbell Creek (Peerless Bench), medium-hard, usually single-bedded; mined extensively for local use in Pickens region; also prospected many years ago on mountain road west of Bemis	1 to 3	430	30
24.	Shale, sandy	10 to 20	450	
25.	Sandstone, Brownstown, gray, massive	10 to 47	497	
26.	Coal, Powellton, medium-hard, single-bedded	1 to 3	500	70
27.	Shale, sandy	0 to 10	510	
28.	Sandstone, Eagle, gray, massive	20 to 46	556	
29.	Limestone and Shale, Newlon, black, fissile shale with limestone "turtle-back" concretions	0 to 20	576	
30.	Coal, Eagle, medium-hard, with bony streaks; known as the "Gimmel Seam" north of Pickens	1 to 4	580	80
31.	Sandstone, Decota, gray, massive	10 to 20	600	
32.	Shales, dark, or sandy	5 to 10	610	
33.	Coal, Little Eagle, seldom found	1 to 0	610	

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
34. Sandstone, Grapevine, gray, massive	20 to 0	610	
35. Shale, Eagle, dark; carries marine fossils in southwestern counties; none found in Randolph	2 to 10	620	
36. Coal, Lower War Eagle, seldom found	1 to 0	620	
37. Sandstone, Lower Gilbert, gray, massive	50 to 25	645	
38. Coal, Gilbert, medium-soft; opened near Adolph on Middle Fork River and mined at Hopkins on Shavers Fork	1 to 5	650	70
39. Shale, sandy	3 to 5	655	
40. Sandstone, Dotson, gray, massive	30 to 10	665	
41. Coal, Douglas, soft, lenticular; noted in a few bore holes on Shavers Fork	1 to 0	665	
42. Sandstone, Lower Dotson; usually absent or represented by sandy shale	10 to 0	665	
43. Shale, Douglas, dark, sandy, laminated	5 to 3	668	
44. Coal, Lower Douglas, soft	0 to 2	670	
45. Shale, gray, sandy	0 to 5	675	25
New River Group (200' to 400')			
46. Sandstone, Upper Nuttall, gray, massive, sometimes pebbly; frequently combined with Lower Nuttall	10 to 30	705	
47. Shale, sandy, dark	10 to 0	705	
48. Coal, Iaeger "B", seldom found	1 to 0	705	
49. Sandstone, Lower Nuttall, gray, massive, sometimes pebbly; frequently combined with Upper Nuttall	20 to 50	755	
50. Shale, Upper Iaeger, dark, sandy	5 to 2	757	
51. Coal, Hughes Ferry, soft, columnar, single-bedded; quite generally present	1 to 3	760	85
52. Shale, sandy	5 to 10	770	
53. Sandstone, Middle Iaeger, gray, massive	10 to 23	793	
54. Coal, Lower Iaeger, soft	1 to 2	795	35
55. Shale, Lower Iaeger, sandy	0 to 5	800	
56. Sandstone, Harvey, gray or brown, massive	15 to 37	837	
57. Shale, Sandy Huff, dark-gray, argillaceous, laminated	5 to 0	837	
58. Coal, Castle, soft, columnar, single- or double-bedded; frequently noted on Middle Fork and Shavers Fork; mined on Point Mountain	1 to 3	840	45
59. Shale, sandy	0 to 10	850	
60. Sandstone, Guyandot, grayish-white, massive	20 to 38	888	
61. Shale, Skelt, dark-gray; carries marine fossils in Point Mountain region of Webster County; none observed in Randolph	5 to 0	888	

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
62.	Coal, Sewell "B", soft, columnar	0 to 2	890	
63.	Shale, sandy	0 to 10	900	
64.	Coal, Sewell "A", usually absent	1 to 0	900	
65.	Sandstone, Lower Guyandot, grayish-white, massive, coarse; sometimes combined with Guyandot Sandstone to form great cliff	10 to 20	920	
66.	Shale, Hartridge, black, fissile, and carbonaceous, with nodules of iron carbonate; often carries a mixed fauna of marine and non-marine origin, Lingula, Naiadites elongata; abundant plant fossils	2 to 5	925	
67.	Coal, Sewell (Sharon of Pennsylvania), soft, columnar, usually single-bedded; mined on Middle Fork, on Rich and Point Mountains, on Back Fork of Elk, on Mill Creek, and on Shavers Fork	2 to 5	930	90
68.	Shale, sandy	5 to 10	940	
69.	Sandstone, Welch, gray, massive, or shaly	10 to 27	967	
70.	Shale, dark, argillaceous, lenticular; carries Naiadites fossils on Shavers Fork north of Cheat Bridge	5 to 0	967	
71.	Coal, Welch, soft, columnar	1 to 3	970	40
72.	Shale, sandy	3 to 15	985	
73.	Sandstone, Upper Raleigh (Sharon), grayish-white, massive; great conglomerate of Rich Mountain region; often contains quartz pebbles 2" in diameter. This rock is usually the base of the Pottsville west of Tygart Valley	25 to 60	1045	
74.	Coal, Little Raleigh, soft; seldom found	1 to 0	1045	
75.	Shale, sandy or sandstone, shaly, horizon of Lower Raleigh Sandstone; usually absent	15 to 0	1045	
76.	Coal, Beckley, soft, columnar; seldom found	1 to 0	1045	
77.	Sandstone, shaly, or sandy shale, horizons of Quinnimont Sandstone and Quinnimont Shale; seldom present	0 to 15	1060	
78.	Coal, Fire Creek, "Quinnimont", soft, double-bedded; present in Allegheny Mountain from Laneville southward to Job; thin and lenticular on Shavers Fork; usually absent west of Tygart Valley	0 to 5	1065	95
79.	Shale, sandy, with sandstone	0 to 10	1075	
80.	Coal, Little Fire Creek, lenticular; seldom found	1 to 0	1075	

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
81.	Shale, dark or sandy; usually absent	10 to 0	1075	
	Shales, red or green (Top of Mauch Chunk Series)	--	--	---

SUBDIVISIONS, POTTSVILLE SERIES.

In southern West Virginia where the Pottsville reaches its maximum State development the series was long ago subdivided by the late I. C. White into three groups, in descending stratigraphic order as follows:

	Feet.
Kanawha Group	2,100
New River Group	1,030
Pocahontas Group	720
Total	3,850

Of these three groups the Pocahontas does not extend northeast of the western edge of Greenbrier and the southwestern corner of Nicholas County, being absent through lack of deposition in all State territory northeast of the region named. As indicated by the General Section the grouping of the series in Randolph County is as follows:

	Feet.
Kanawha Group	350 to 675
New River Group	200 to 400
Total	550 to 1075

The two groups found in Randolph County have many similar subdivisions, or members, which will be discussed under a separate heading. Several of these members have now been traced entirely across West Virginia, Maryland, and Pennsylvania in all three of which States the same nomenclature has been largely employed, except that in southern West Virginia the expanded series was rather carefully studied before its relationship to the more northern Pottsville was fully understood and hence certain of the southern names employed have become firmly fixed and in some measure supplant the earlier Pennsylvania titles. Farther south in the Appalachian region different groupings and different names of members have been used in Virginia, Kentucky, Tennessee, and Alabama, so that it is difficult to know the extent of any group or member, but there is little doubt that various beds of the West Virginia Pottsville continue through several of these States and could be traced across them by patient work.

TOPOGRAPHIC EXPRESSION, POTTSVILLE SERIES.

The Pottsville Series in Randolph County almost invariably makes rough mountains and narrow, V-shaped valleys. Typical regions may be noted along Middle Fork River above Cassity and along the branches of Buckhannon River north and northeast of Pickens. In some of this territory, particularly on Middle Fork, the Upper Connoquenessing Sandstone forms rather narrow plateaus on the ridges followed below by steep slopes. Southeast of Pickens and in the Point Mountain country the summits of the ridges become rather smooth and gentle partly on account of extended peneplanation. Farther east, on Shavers Fork and Otter Creek, the Pottsville topography becomes extremely rough and forbidding, with many cliffs jutting out toward the valleys and with slopes that are littered with large accumulations of debris. In this region, as well as in various others, the basal rocks of the series form conspicuous escarpments along the mountain ridges which enclose the basins.

AREAL EXTENT, POTTSVILLE SERIES.

The outcrop of the Pottsville Series, which probably once covered the entire county, is now confined to three general areas, the first being the western part of the county west of Rich Mountain and farther south in the Point Mountain, Elk and Gauley country; the second being the valleys of Otter Creek and Shavers Fork forming a central northeast and southwest belt along the North Potomac (Georges Creek) Syncline; and the third being the basinal area south of Laneville toward Harman and Job in the extreme northeastern corner of the county. Figure 7 shows at a glance the locations of these areas and on Map II they may be studied in more detail.

CONTACTS, POTTSVILLE SERIES.

The contact of the Pottsville with the overlying Allegheny Series has already been discussed on a previous page, the main difference being in the floras and in the more conglomeratic nature of the Pottsville sandstones. The lower contact with the Mauch Chunk Series is more striking. Here the base of the Pottsville is usually, though not always, made by the coarse and pebbly Upper Raleigh (Sharon) Sandstone of the New River Group, there being still lower coals, shales, and shaly sandstones in certain localities. These unmistakably Upper Carboniferous beds lie upon the red or green and micaceous shales of the Bluestone Group of the Mauch Chunk Series which is largely devoid of coals or carbonaceous shales and which entirely lacks the abundant

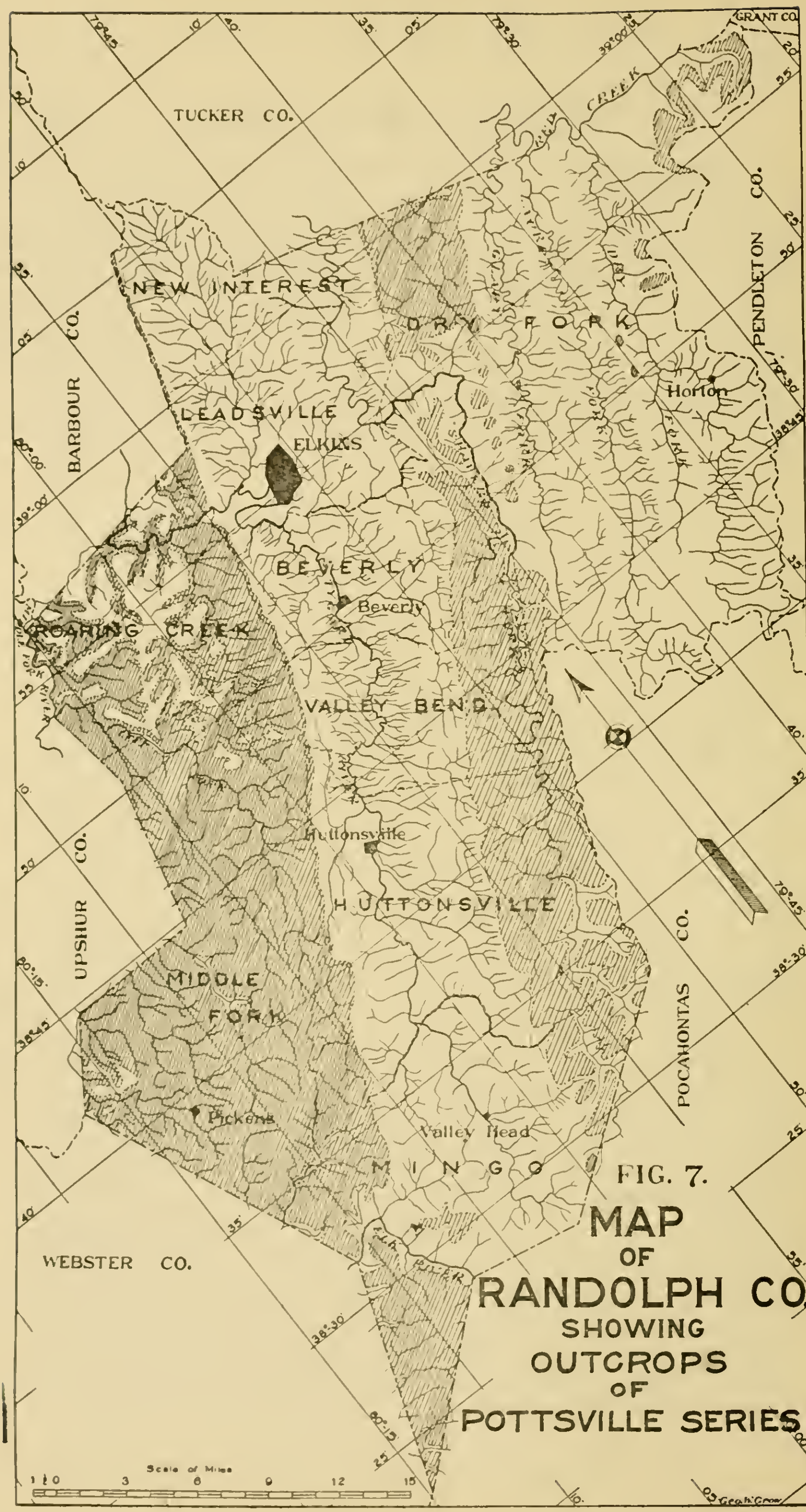

FIG. 7.

MAP OF RANDOLPH CO. SHOWING OUTCROPS OF POTTSVILLE SERIES plant floras which characterize the Pottsville, although plants of an older type are by no means absent in the Mauch Chunk. It is very certain, however, that the Bluestone Group is greatly attenuated as compared to southern West Virginia and it is also certain that the entire Pocahontas Group of the Pottsville is absent as well as the lower part of the New River. It is therefore evident that a very considerable unconformity exists at this contact.

FOSSIL LIFE, POTTSVILLE SERIES.

In the Pottsville Series fossil plant life is abundant and well preserved both in the shales above the coals and in the bases of the sandstones. These forms have been widely studied in southern West Virginia by many authorities[6]. In northern and central West Virginia an equal amount of attention has not been paid to them but in Randolph County several rather careful collections were made by Dr. David White and the writer, mostly in the New River Group, including Lots 380, 381, 403, 404, 406, 408, 436, 443, 447, 449, 450, and 461. Most of these collections have not yet been studied by Dr. White but such as may later become available will be found in Chapter XIV.

In sharp contrast to the abundance of plant life in the Pottsville is the very scanty occurrence of marine or even of brackish-water faunas. In certain other counties the Kanawha Group contains several well-known marine beds but in Randolph few of these marine beds have yet been found. There are occasional brackish-water faunas partly in the Kanawha and partly in the New River Group and in the adjacent county of Webster there is a definite marine horizon in the latter group but its fossils have not yet been recognized in Randolph. One collection (Lot 405) was made in the New River Group, the identifications of which by Dr. Tilton will be found on a subsequent page under the description of the Hartridge Shale and also in Chapter XV.

CORRELATION, POTTSVILLE SERIES.

Owing to its included commercial coals the Pottsville Series has been the subject of intense study wherever it occurs in the Appalachian States. From West Virginia northward into Maryland and western Pennsylvania there is a great similarity of thickness, lithology, and sequence of beds and hence little doubt as to the correlations of individual members. Farther northeast, however, in the typical Pottsville locality of northeastern Pennsylvania, there is still some

[6]See Vol. V(A), Part II, W. Va. Geol. Survey, 1913, for discussion of many of these plants by David White.

uncertainty as to the proper correlation of individual members across the eroded territory of central Pennsylvania, although much excellent work has been done by Dr. David White and other paleobotanists. In West Virginia the fact that the series thickens ten times in passing southwestward across the State has introduced an intrastate problem of correlation of no small proportions. In a former publication of the Survey[7] the writer has given careful expression of his views based on the studies of many years, and as those views have not materially changed no further statement is required. As previously stated the writer believes that the Pottsville of the southern States could be closely linked with that of West Virginia if all of its phases, including the stratigraphy, plant fossils, and marine faunas, were carefully studied with such a definite end in view. In advance of such a sustained study hasty impressions may well be reserved.

DESCRIPTION OF MEMBERS, KANAWHA GROUP OF POTTSVILLE SERIES.

Homewood Sandstone.

The **Homewood Sandstone,** named by I. C. White from its outcrop in Beaver County, Pennsylvania, and coming at the top of the Pottsville, is usually found in massive development wherever its horizon occurs above drainage in the county. Generally it is grayish-white, massive or current bedded, often conglomeratic with angular or slightly rounded white quartz pebbles, and varying in thickness from 25 to 60 feet.

In **Roaring Creek District** it is recorded in the measured sections of Chapter V for Findley, Leiter, Norton, and Pumpkintown and it is prominent in the valley of Roaring Creek from its mouth to Coalton and Mabie. Just southeast of Coalton it is massive, pebbly, and 40 feet thick at elevation 2240′ B., coming 15 feet above the top of the Upper Connoquenessing. Along Tygart River, from the Barbour County line to Norton, it makes a double line of cliffs in conjunction with the Upper Connoquenessing. At the **Coal and Coke Railway Quarry,** located on the south side of the line 0.9 mile northwest of Leiter, the stone has been quarried extensively and crushed for railroad ballast, 35 feet of the ledge being exposed, with its top at elevation 1975′ B. The quarry is 100 feet long and extends into the hill 100 feet, the stone being gray and massive, with numerous joint- and bedding-

[7] David B. Reger, Mineral and Grant Report, W. Va. Geol. Survey, pp. 249-253; 1924.

planes. Along Middle Fork River it is a prominent cliff in the hilltops in the vicinity of Gale.

In **Middle Fork District** it is recorded in the measured sections of Chapter V for Cassity, Cassity Fork, Arvondale Junction, and Silica. At the latter point it was once quarried for glass-sand by the **Enterprise Silica Sand Company** to which further reference will be made in Chapter XIII.

In **Leadsville District** it is recorded in the measured sections of Chapter V for Gage, Laurel, Harding, and Laurel Ridge. At the **Workman Brothers Quarry,** located along the Western Maryland Railway on the east side of Tygart River at Kaufman Church one mile northeast of Laurel, it has been quarried extensively, mostly for railroad ballast. The quarry is 200 feet long and extends into the hill 100 feet, the cliff being 50 feet thick, with an elevation of 1883′ B. at the top. Stone from this quarry was used for the abutments and piers of the Coal and Coke Railway bridge across Tygart River where it cuts through the gorge between Rich Mountain and Laurel Ridge, and also for the palatial residence of the late Henry G. Davis at Elkins.

In **Beverly District** the Homewood is recorded in the section for Bemis, page 160, being 40 feet thick, white, massive, and pebbly, and forming the top of the mountain northwest of Bemis.

Hammond Fire Clay.

The **Hammond Fire Clay** of Hennen[8], apparently filling the interval between the Homewood Sandstone and Upper Mercer Coal in this region where the Tionesta Coal and Mt. Savage Fire Clay appear to be absent by disconformity, is seldom more than a bed of sandy shale and usually quite unfit for economic consideration. In the Harding Section, page 148, it is noted as 3 feet thick and slaty. Elsewhere it is almost wholly composed of shale.

Upper Mercer Coal.

The **Upper Mercer Coal** of the Second Geological Survey of Pennsylvania, coming a few feet beneath the Homewood Sandstone in Randolph County, attains minable thickness in various regions and will therefore be discussed in Chapter X under the subject of "Commercial Coal." On Figure 20 its supposed minable extent is indicated and on Map II its outcrop for the same region is delineated.

[8]Ray V. Hennen, Monongalia-Marion-Taylor Rept., W. Va. Geol. Survey, pp. 369-370; 1913.

Kanawha Black Flint.

The **Kanawha Black Flint** of Rogers[9], later described more fully by White[10], is an important member of the Pottsville Series in many counties of the Great Kanawha Valley, but in Randolph it has not been recognized. Its flinty character most certainly disappears far southwest of Randolph but its marine fossils persist in its shaly phase as far northeast as Upshur County and have been tentatively recognized along the Laurel Ridge in Barbour. It would therefore appear possible that patient search might reveal them in that part of Randolph west of Rich Mountain. The apparent position of this member is slightly below the Upper Mercer Coal and just above the Lower Mercer (Stockton) Coal.

Lower Mercer (Stockton) Coal.

The **Lower Mercer Coal** of Pennsylvania, which appears to correlate with the Stockton Coal of White[11], belongs in the interval between the Kanawha Black Flint and the Upper Connoquenessing Sandstone. In Randolph it is generally separated from the Upper Mercer Coal by 5 to 20 feet of sandy shales or thin sandstones the lower portion of which may represent the Flint horizon. Its position in the strata is indicated in the Findley Section, page 128. In a portion of Middle Fork District it reaches minable thickness and its further discussion will therefore be reserved for Chapter X under the subject of "Commercial Coal." Figure 21 shows its supposed minable extent and on Map II its outcrop for the same region is delineated.

Upper Connoquenessing Sandstone.

The **Upper Connoquenessing Sandstone,** first named and described by I. C. White from its occurrence in Lawrence County, Pennsylvania, and having its base 150 to 200 feet below the top of the Homewood, is one of the most conspicuous members of the Pottsville in Randolph County. Generally it is gray, massive, and usually conglomeratic with angular or slightly rounded white quartz pebbles, and it often makes huge cliffs in the topography. In various reports the writer has stated the opinion that a portion of this ledge represents the Upper Coalburg Sandstone of the Kanawha Valley, based on the fact that in southern Upshur County the Upper Connoquenessing loses its pebbly character and

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[9]W. B. Rogers, Fifth Annual Report of Virginia, 1839.

[10]I. C. White, Bull. 65, U. S. Geol. Survey, p. 98 (1891); and Vol. II, W. Va. Geol. Survey, pp. 328-331 (1903).

[11]I. C. White, Vol. II, W. Va. Geol. Survey, p. 583; 1903.

apparently splits into two or three benches which are thereafter traceable to the Kanawha River.

In **Roaring Creek District** the Upper Connoquenessing is recorded in the measured sections of Chapter V for Findley, Norton, and Pumpkintown. Along Tygart River this ledge rises above drainage near the Barbour County line, and together with the Homewood above it, makes great cliffs along both sides of the river all the way to Norton, where the dip of the measures toward the Belington Syncline has partly submerged it, but the southeastward rise soon brings it above the river and it is conspicuous along the mountainside, rising to the top of Rich Mountain at the river gap. Along Roaring Creek it forms twin cliffs with the Homewood, being pebbly and massive. At the southeastern end of Coalton its top is visible in the creek bank at elevation 2225′ B., and just east of Coalton it covers the top of a long sloping point of Rich Mountain for a mile or more, rising toward the main mountain with the topography.

In **Middle Fork District** it is recorded in the measured sections of Chapter V for Lost Run of Middle Fork, Lick Run of Middle Fork, Cassity, Cassity Fork, Laurel Branch of Middle Fork, Adolph, Big Laurel Thicket, Arvondale Junction, and Silica. As would be inferred from these numerous sections it is a prominent feature along Middle Fork River, being noticeable all the way from Ellamore to the Big Laurel Thicket where it caps the mountain. In the vicinity of Cassity the southward rise of the rocks has elevated it nearly to the top of the hills, and southward it remains at the same level, just topping the ridges with a great, pebbly ledge, the debris and pebbles from which litter the valley below. West of Adolph the rise of the rocks toward the Hiram Anticline keeps the ledge near the top of the hills all the way to Blue Rock, where it makes a prominent cliff 50 feet thick at elevation 3300′ B., just east of the divide between Middle Fork and Buckhannon Rivers. Northward from Blue Rock it caps the ridge of the mountains, being prominent at See Camp Gap, and descending northward with the dip of the measures along the axis of the anticline, all the way to Middle Fork River.

In **Leadsville District** the Upper Connoquenessing is recorded in the measured sections for Gage, Laurel, Harding, and Laurel Ridge, varying from 55 to 100 feet in thickness at these exposures. North of Tygart River along the gap it is prominent in the western slope of Laurel Ridge.

In **Beverly District** it is noted in the measured sections for Bemis, Bowden, and Cheat Junction, being a prominent feature in the top of Cheat Mountain along the axis of the North Potomac (Georges Creek) Syncline.

In **Dry Fork District** it appears to be the Upper Connoquenessing ledge which, in the valley of Otter Creek, makes a long ridge immediately north of Yellow Creek. Farther east it may be observed in the mountains about Laneville where it is preserved along the Stony River Syncline.

So far as known it has not been quarried in the county and generally its pebbly character would make it unsuitable for anything except rough masonry structures or for buildings where its odd appearance would be desired.

Quakertown "Rider" (Coalburg) Coal.

The **Quakertown "Rider"** Coal of Reger[12], which appears to be at or near the horizon of the **Coalburg Coal** of the Great Kanawha Valley, belongs just under the Upper Connoquenessing Sandstone and a few feet above the Quakertown Coal as indicated by the measured section for Laurel, page 148, this being its type locality. Here the coal is only four inches thick and is of no commercial value. Elsewhere in Randolph it is seldom noted but in the Maxwell and Crawford No. 3 (3) Coal Test Boring in Roaring Creek District it is recorded as 0′ 2″ thick. Southwest of Randolph County this streak of coal apparently thickens and eventually becomes valuable in the Great Kanawha Valley.

Quakertown Shale.

The **Quakertown Black Slate** of Reger[13], or **Quakertown Shale** as it should more properly be called on account of the fact that it is not a metamorphosed slate but rather a hard fissile shale, occupies a portion of the interval between the Quakertown "Rider" Coal and the Quakertown Coal, as exhibited in the measured section for Laurel, Leadsville District, page 148, this being its type locality. Here it is black, fissile, carbonaceous, and 3 feet thick, containing rather abundant specimens of **Lingula kanawhensis** and **Naiadites elongata**, according to Dr. W. Armstrong Price who examined the original collection of the writer. Its importance in the stratigraphy of the Pottsville is almost wholly due to these fossils which have been traced into several counties. In Chapter V it is also recorded in the measured sections for Gage, Leadsville District, and Cassity, Middle Fork District, **Naiadites** being in evidence at the latter locality. Its presence will be further noted in the descriptions of the bed-sections of the Quakertown Coal in Chapter X.

[12]David B. Reger, Barbour and Upshur Counties and Western Portion of Randolph County Rept., W. Va. Geol. Survey, p. 273, 1918.
[13]Ibid., pp. 273-4.

Quakertown (Winifrede?) Coal.

The **Quakertown Coal**, named by Dr. I. C. White from its occurrence at the village of that name on the Mahoning River near the Ohio and Pennsylvania State line, and believed by the writer to be at or near the horizon of the **Winifrede Coal** of Kanawha County, West Virginia, belongs a few feet below the Upper Connoquenessing Sandstone from which it is mainly separated by the Quakertown Shale. In Randolph County it is somewhat lenticular but in portions of Roaring Creek and Middle Fork Districts it has a thickness of two feet or more of clean coal and should eventually furnish a considerable amount of fuel, as will be discussed more fully in Chapter X under the subject of "Commercial Coal." Figure 22 shows its supposed minable area and on Map II its outcrop for the same area is delineated. Its stratigraphic position is exhibited in the measured sections of Chapter V for Lick Run of Middle Fork, Cassity, and Cassity Fork, all in Middle Fork District; and for Gage and Laurel in Leadsville District; and for Otter Creek in Dry Fork District, Tucker County.

Lower Connoquenessing (Lower Winifrede) Sandstone.

The **Lower Connoquenessing Sandstone** of I. C. White, separated from the Quakertown Coal by only a few feet of shale, may be frequently observed in the Pottsville stratigraphy of the county, being gray and massive and 20 to 35 feet thick. The measured sections of Chapter V record it at Norton, Roaring Creek District; Laurel Branch of Middle Fork, Middle Fork District; and Gage and Laurel Ridge, Leadsville District. The writer has frequently expressed the opinion that this ledge belongs at the approximate stratigraphic position of the Lower Winifrede Sandstone of the Great Kanawha Valley. So far as known it has not been quarried at any point in the county but it is doubtless true that many of the large boulders which have been split into blocks in the gap of Tygart River below Elkins and taken to the latter point for building have come from its outcropping ledge.

Winifrede Limestone.

The **Winifrede Limestone** of White[14], which contains abundant marine fossils at its type locality in the Great Kanawha Valley where it belongs 60 to 70 feet below the Winifrede Coal, was not identified within the limits of Randolph County but the section for Otter Creek, Dry Fork

[14] I. C. White, Vol. II(A), W. Va. Geol. Survey, p. 431; 1908.

District, Tucker County, page 196, shows a dark, sandy shale, 20 feet thick and containing plant fossils and **Lingula,** which may represent its horizon. It is very true that no limestone is present but generally the limestones of the Kanawha Group are lenticular and must be traced in greater extent by the shales which often hold their faunas. There is good reason to believe that a more patient search might reveal some of these fossils, especially in Middle Fork District.

Upper Chilton Sandstone.

The **Upper Chilton Sandstone** of White[15], occupying most of the interval between the Winifrede Limestone horizon and the Chilton Coal when present in Randolph County, is a gray, massive stratum, 15 to 30 feet thick. In Chapter V it is recorded in the measured sections for Norton, Roaring Creek District; Bemis, Beverly District; and Cheat Bridge, Huttonsville District. So far as known it has not been quarried and often it is too shaly for this purpose but at some localities it could be used.

Chilton Coal.

The **Chilton Coal** of White[16], belonging only a few feet under the Upper Chilton Sandstone in Randolph County and about 300 feet below the top of the Homewood Sandstone in the Pickens and Bemis regions, is poorly represented, being seldom as much as two feet thick and usually absent. As a commercial fuel it appears to offer little possibility.

In **Middle Fork District** it is recorded as 0′ 11″ thick in the Cassity Fork Boom & Lumber Company Coal Test No. 1 (16), and in the Cassity Fork Section, page 135, it is noted as a streak. What appears to be the same coal is reported by Teets at the **Gottfried Buskey Prospect, No. 66 on Map II,** on the eastern side of Turkeybone Mountain 1.8 miles southeast of Pickens at elevation 3450′ B. Information on the bed-section is lacking as the prospect had fallen shut but its position indicates that it is the Chilton Coal, as it is 275 to 300 feet below the Lower Kittanning and 125 feet above the Campbell Creek (Peerless).

In **Beverly District** the following prospect appears to represent the Chilton Coal:

Davis Coal Land Company Prospect—No. 67 on Map II.

Along old Bemis Railroad grade between forks of Fishinghawk

[15]Ibid., p. 271.
[16]Ibid., p. 430.

Creek, 1.5 miles northwest of Bemis; **Chilton Coal**; elevation, 3485' B.

		Ft.	In.
1.	Sandstone, Upper Connoquenessing, massive, pebbly, cliff, estimated	100	0
2.	Concealed, estimated	60	0
3.	Coal ....0' 10"	1	10
4.	Slate, coaly 1 0		
5.	Sandstone, to grade	2	0

In **Valley Bend District** the Chilton Coal is recorded as a blossom in the measured section for Cheat Junction, page 162, at elevation 3498' B.

In **Huttonsville District** it is recorded in the West Virginia Pulp and Paper Company Coal Test No. 10 (61) as 1' 0" thick.

Blackwater Shale and Limestone.

The **Blackwater Shale and Limestone** of Reger[17], noted on the north side of Blackwater River two miles southwest of Davis, Tucker County, where it contains marine fossils of the Kanawha types and is believed to represent the **Dingess Limestone** of Mingo County, was not observed in Randolph. The Dingess Limestone in the somewhat abbreviated Pottsville column of Randolph should belong between the Chilton Coal and Upper Cedar Grove Sandstone and at or near the Blackwater horizon. This zone is mainly occupied by sandy shale in Randolph but it is believed that further search might reveal the Dingess fossils.

Upper Cedar Grove Sandstone.

The **Upper Cedar Grove Sandstone** of Hennen and Reger[18], occupying part of the interval between the Chilton and Cedar Grove Coals, appears to be poorly represented in the northern portion of Randolph but thickens toward the south and may be recognized at certain points. In some localities it reaches a thickness of 20 to 25 feet, being gray and massive. In **Beverly District** it is recorded in the Bemis Section, page 160, as 15 feet thick, white, and hard. In general it is not a conspicuous ledge.

Cedar Grove Coal.

The **Cedar Grove Coal** of White[19], occupying part of the

[17]David B. Reger, Tucker Report, W. Va. Geol Survey, pp. 209-210; 1923.

[18]Ray V. Hennen and David B. Reger, Logan and Mingo Report, W. Va. Geol. Survey, pp. 169-170; 1914.

[19]I. C. White, Bull. 65, U. S. Geol. Survey, pp. 138-40 (1891); and Vol. II, W. Va. Geol. Survey, p. 562; (1903).

interval between the Upper Cedar Grove and Peerless Sandstones, is poorly represented in Randolph County, being unrecognizable at most points and apparently having no commercial possibilities. In **Roaring Creek District** it is recorded in the Maxwell and Crawford Coal Test No. 3 (3) as 3′ 1″ thick and slaty. In **Valley Bend District** its blossom is noted in the Cheat Junction Section, page 162, at elevation 3432′ B. In **Huttonsville District** it is reported in the West Virginia Pulp & Paper Company No. 8 (57) Coal Test Boring as only 0′ 1″ thick.

Peerless Sandstone.

The **Peerless Sandstone** of Krebs[20], described in certain other reports as the **Lower Cedar Grove Sandstone,** occupies most of the interval between the Cedar Grove and Alma Coals in Randolph County. When present it is usually gray and massive and 10 to 50 feet in thickness. In **Roaring Creek District** it is recorded in the Norton Section, page 129, as 6′ 4″ thick and gray in color. In **Leadsville District** it is noted in the Susan Darby No. 1 (43) Coal Test Boring as 29′ 9″ thick, blue, and hard. At certain other points it has been noted in connection with the Alma Coal. So far as known it has not been quarried but it would doubtless furnish acceptable building stone for masonry structures.

Alma Coal.

The **Alma Coal** of White[21] belongs a few feet below the Peerless Sandstone in Randolph County but is of lenticular occurrence, being seldom noted except at certain points in **Middle Fork District** near Pickens. Here it is medium-hard, seldom more than two feet in thickness, and does not appear to have commercial possibilities. **Prospect No. 68 on Map II,** located on Mitchell Lick Fork of Middle Fork River 0.3 mile southwest of Adolph at elevation 2540′ B., had fallen shut, its thickness not being reported. **Prospect No. 69 on Map II,** located on Middle Fork River 0.4 mile southeast of Adolph at elevation 2570′ B., was also abandoned. At the following prospect the coal was partly exposed:

Fred Rush Prospect—No. 70 on Map II.

On Middle Fork River 0.4 mile east of Adolph; **Alma Coal;** elevation, 2525′ B.

	Ft.	In.
1. Slate, black	3	0
2. Coal	0	11
3. Concealed by water, may have another streak of coal	--	--

[20]C. E. Krebs, Kanawha Rept., W. Va. Geol. Survey, p. 281; 1914.
[21]I. C. White, Vol. II(A), W. Va. Geol. Survey, pp. 404-7; 1908.

One mile southwest of Adolph the blossom of a coal was observed at the root of a fallen tree, south of Birch Fork, at an elevation of 2790′ B., that represents this coal. At **Prospect No. 71 on Map II,** on Left Fork of Right Fork of Buckhannon River just south of Czar, this coal was opened at an elevation of 2325′ B., but the place had fallen shut and could not be measured. The following opening was noted by Teets:

J. J. Wuerzer Farm Mine—No. 72 on Map II.

On Trout Run one mile southwest of Czar; **Alma Coal**; elevation, 2570′ B.

		Ft.	In.
Slate		--	--
Coal, soft	1′ 6″		
Slate, gray	0 6		
Coal, soft	3 0	5	0
Slate, pavement		--	--

One-third mile southeast of Pickens a thin coal occurs that is 25 feet above the Campbell Creek (Peerless) Coal. It was once opened, according to Teets, at the **James Pickens Prospect, No. 73 on Map II,** having an elevation of 2915′ B., but the prospect had fallen shut and could not be measured. This coal appears to represent the Alma horizon.

Monitor Sandstone.

The **Monitor ("Logan") Sandstone** of Hennen and Reger[22], belonging a few feet above the Campbell Creek (Peerless Bench) Coal, is poorly developed in northern Randolph but southward it thickens to 25 feet or more, being usually gray and massive. In **Leadsville District** it is recorded in the Susan Darby No. 2 (44) Coal Test Boring as 34′ 6″ thick. In **Huttonsville District** it is noted in the Cheat Bridge Sections, page 167, as 35 feet thick. Elsewhere it has frequently been observed in connection with the Campbell Creek (Peerless Bench) Coal as will be recorded in connection with descriptions of the bed-sections of the coal in Chapter X. So far as known it has not been quarried but in some localities could furnish building stone if desired.

When first described in Logan County this sandstone was given the name "Logan" but owing to the previous use of the same title for a sandstone in the Pocono Series the name of "Monitor" has been substituted and used in later reports.

[22]Ray V. Hennen and David B. Reger, Logan and Mingo Rept., W. Va. Geol. Survey, pp. 178-180 (1914); see also Wyoming-McDowell Rept., p. 148 (1915).

Campbell Creek (Peerless Bench) Coal.

The **Campbell Creek Coal** of White[23], which later proved to be composed of two distinct benches, the upper of which has been known as the **Peerless Bench** and the lower as the **No. 2 Gas Bench,** is represented in Randolph County by a thin but excellent coal which has been mined for local domestic use in the Middle Fork and Pickens regions. When the Barbour, Upshur and Western Randolph Report was published in 1918 it was supposed that this coal was the No. 2 Gas Bench, based on the erroneous idea that this lower bench was the more persistent of the two. Subsequent work in intermediate counties between the Great Kanawha Valley and Randolph County, however, has rather conclusively proved that the upper or Peerless Bench, rather than the No. 2 Gas, is the principal portion of the original Campbell Creek passing northeastward through Nicholas and Webster Counties and into Randolph. This coal will accordingly be so described in the present Report.

In the measured sections of Chapter V the stratigraphic position of this coal in **Roaring Creek District** is recorded at Norton and Pumpkintown; in **Middle Fork District** at Cassity, Laurel Branch of Middle Fork, and Silica. Its approximate minable extent is exhibited on Figure 23 and on Map II its outcrop for the same region is delineated. Its further discussion, with bed-sections and chemical analyses, will be found in Chapter X under the subject of "Commercial Coal."

Brownstown Sandstone.

The **Brownstown Sandstone** of White[24] occupies most of the interval between the Campbell Creek (Peerless Bench) Coal and the Powellton Coal in the Randolph County column. This ledge, when present, is usually gray and massive, varying in thickness from 10 to 50 feet. In **Roaring Creek District** its position is noted in the Norton Section, being 21′ 11″ thick. In **Middle Fork District** it is recorded in the Cassity Fork Boom and Lumber Company Co. No. 3 (18) Coal Test Boring where it is 75′ 7″ thick, and in the Pickens region it is a massive ledge, 10 to 40 feet thick. In **Valley Bend District** the Cheat Junction Section exhibits it as a massive cliff, 50 feet thick. In **Huttonsville District** it is 59 feet thick in the West Virginia Pulp & Paper Company No. 1A (50) Coal Test Boring, 32 feet thick in the No. 3 (52) Boring, and 13′ 5″ in the No. 10 (61) Boring of the same company.

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[23] I. C. White, Bull. 65, U. S. Geol. Survey, p. 168 (1891); and Vol. II, W. Va. Geol. Survey, p. 566 (1903).

[24] I. C. White, Vol. II, W. Va. Geol. Survey, p. 586; 1903.

So far as known this stone has not been quarried in the county but its massive and durable character at various localities would make it suitable for masonry structures.

Powellton Coal.

The **Powellton (Brownstown) Coal** of White[25], when present in Randolph County, belongs between the Brownstown and Eagle Sandstones. It is not persistent, however, and offers little hope for commercial exploitation although it may furnish a small amount of local domestic fuel. When found it is usually medium-hard and single-bedded, with a thickness that varies from one to three feet.

In **Roaring Creek District** this coal is recorded in the Norton Section, page 129, as 2′ 8½″ thick; in the Maxwell and Crawford No. 3 (3) Coal Test Boring as 5′ 1″ thick, and slaty or bony; and in the P. J. Cain No. 1 (13) Coal Test Boring as 0′ 10″ thick and bony. It was once opened at the **William Tallman Prospect (No. 121 on Map II)**, on Left Fork of Middle Fork River 1.1 miles southeast of Gale, having an elevation of 1940′ B. and a reported thickness of one foot.

In **Middle Fork District** it is recorded in the Cassity Fork Boom & Lumber Company No. 2 (17) Coal Test Boring as 2′ 0″ thick. It has been opened at the **Washington Bunner Farm Mine (No. 122 on Map II)**, on Bearcamp Run of Left Fork of Buckhannon River 0.8 mile northwest of Czar, having an elevation of 2380′ B. and a thickness of 1′ 3″, according to Teets. The **W. O. Smith Prospect (No. 123 on Map II)**, located on Hooker Run of Middle Fork of Buckhannon 1.6 miles south of Newlon, showed 1′ 1″ of coal, according to Teets, at an elevation of 2085′ B. It was opened on the same run at **Coal Prospect No. 124 on Map II**, located 2.2 miles south of Newlon, at an elevation of 2235′ B., there being no report on its thickness. At **Coal Exposure No. 125 on Map II**, located on Right Fork of Buckhannon River 0.3 mile west of Silica, a coal is visible in the railroad cut that apparently represents the Powellton, its thickness being 0′ 5″ and its elevation 2350′ B. At **Coal Prospect No. 126 on Map II**, located on the same fork of Buckhannon 0.7 mile southeast of Silica, one foot of soft coal was found, having an elevation of 2460′ B. and coming 20 to 30 feet above the Eagle Coal. It was opened again at **Coal Prospect No. 127 on Map II**, located on the same fork of Buckhannon 1.3 miles northwest of Pickens, having an elevation of 2570′ B., but its thickness being unknown.

In **Leadsville District** the Powellton Coal is recorded in

[25]I. C. White, Vol. II, W. Va. Geol. Survey, pp. 511-12 (1903); and Vol. II(A), pp. 272 and 349 (1908).

the Gage Section, page 147, as 1′ 2″ thick; and in the Susan Darby No. 1 (43) Coal Test Boring as 0′ 6″ thick. In Huttonsville District it appears in the West Virginia Pulp & Paper Company No. 3 (52) Coal Test Boring with a thickness of only 0′ 8″.

Eagle Sandstone.

The Eagle Sandstone of Hennen and Reger[26] is recognizable in Randolph County, being a few feet below the Powellton Coal. When found it is usually gray and massive with a thickness varying from 25 to 50 feet. In Middle Fork District the Big Laurel Thicket Section published in Chapter V shows it to be 4½ feet thick and shaly; the Hartridge Section records it as 18 feet; the Czar Section notes it as 50 feet thick, massive and medium-grained; the Silica Section exhibits it as 60 feet thick and massive. In the same district the Elkhorn Coal Corporation No. 3 (27) Coal Test Boring shows it as 55 feet thick.

In Beverly District the Bemis Section notes it as 30 feet thick, making a white, coarse cliff. In Huttonsville District it is recorded in the Ward & Hutton No. 2 (66) Coal Test Boring as 52 feet thick; in the West Virginia Pulp & Paper Company No. 3 (52) Coal Test Boring as 42 feet thick and conglomeratic; and in the West Virginia Pulp & Paper Company No. 8 (57) Coal Test Boring as 44′ 2″. In Mingo District it is reported in the Ward & Hutton No. 1 (67) Coal Test Boring as 39 feet thick.

It is evident from the above notations that the Eagle Sandstone is well developed in the upper Middle Fork and Pickens regions. So far as known it has not been quarried but its massive character makes it suitable for masonry structures and in the Pickens region it is located along transportation.

Newlon Limestone and Shale.

The Newlon Limestone and Shale of Reger[27], coming between the Eagle Sandstone and Eagle Coal, shows the following appearance at its type locality in the cut of the Chemical and Helvetia Railroad just east of Newlon, Banks District, Upshur County:

	Ft.	In.
Shale, dark, sandy, with numerous concretions and large siliceous limestone "turtle-backs", Newlon Limestone and Shale	25	0
Slate, dark, coaly, Eagle Coal (1915′ B.)	0	6
Fire clay, siliceous, to grade	4	0

[26] Ray V. Hennen and David B. Reger, Logan and Mingo Rept., W. Va. Geol. Survey, p. 199; 1914.

[27] David B. Reger, Barbour, Upshur and Western Randolph Rept., W. Va. Geol. Survey, pp. 281-282; 1918.

The shale at this locality has the appearance of a marine formation although no fossils were found, but on Right Fork of Buckhannon River 0.7 mile southeast of Arvondale Junction, Middle Fork District, it carries small specimens which were identified by Dr. W. Armstrong Price as **Naiadites elongata**, which is common in the Kanawha Series.

In the same district the shale is recorded in the measured sections of Chapter V for Hartridge, Czar, and Arvondale Junction. It was observed on Left Fork of Right Fork of Buckhannon River 0.5 mile southwest of Czar and also at the south edge of the village, where it is a black shale five feet thick at an elevation of 2170′ B. It was also noted in the public road 0.8 mile southwest of Star on Left Fork of Buckhannon River at an elevation of 2900′ B. In Chapter X its occurrence may be further noted in connection with the bed-sections of the Eagle Coal.

Eagle Coal.

The **Eagle Coal** of White[28] is well represented in the Pickens region, having been known locally for many years as the "**Gimmel Seam**" from the opening of that name along Buckhannon River, where coal has also been mined commercially in recent years. In Chapter V its position in the series is exhibited in **Roaring Creek District** by the Norton Section; in **Middle Fork District** by the Cassity, Adolph, Big Laurel Thicket, Hartridge, Czar, Trout Run, and Silica Sections; in **Leadsville District** by the Gage Section; and in **Valley Bend District** by the Cheat Junction Section.

This coal is minable over a considerable area, as indicated on Figure 24, and as delineated by outcrop on Map II. Its further discussion will therefore be reserved for Chapter X under the subject of "Commercial Coal".

Decota Sandstone.

The **Decota Sandstone** of Krebs[29], belonging a few feet under the Eagle Coal, appears to be present in numerous localities in Randolph County, being gray, massive, and usually 10 to 20 feet thick but often exceeding those figures. In **Roaring Creek District** the measured section for Norton exhibits it as 23′ 5″ thick and gray. In **Middle Fork District** the Hartridge Section shows it to be 28 feet thick; in **Huttonsville District** the West Virginia Pulp & Paper Company No. 3 (52) Coal Test Boring records it as 8 feet, and No. 12 (63) Boring of the same company as 97′ 3″; and in **Mingo District**

[28] I. C. White, Bull. 65, U. S. Geol. Survey, p. 140 (1891); and Vol. II, W. Va. Geol. Survey, p. 587 (1903).

[29] C. E. Krebs, Kanawha Rept., W. Va. Geol. Survey, p. 292; 1914.

the Valley Head Section shows it to be white, massive, and pebbly. So far as known it has not been quarried in the county but it could be used for masonry structures if so desired.

Little Eagle Coal.

The **Little Eagle Coal** of White[30], belonging a few feet below the Decota Sandstone, appears to be almost totally absent in Randolph County. In **Huttonsville District** it is noted in the West Virginia Pulp & Paper Company No. 3 (52) Coal Test Boring as 0′ 2″ thick. Elsewhere it was not found.

Grapevine Sandstone.

The **Grapevine Sandstone** of Hennen and Reger[31], belonging next under the Little Eagle Coal in Randolph County, appears to be poorly represented. In **Valley Bend District** the Bemis Section, page 160, shows a white, massive, and pebbly cliff 40 feet thick that has been doubtfully correlated with this horizon. Elsewhere it was not noted.

Eagle Shale.

The **Eagle Limestone and Shale** of White[32] apparently belongs 35 to 40 feet below the Eagle Coal in Randolph County but is poorly represented, being occasionally recognizable as a dark, sandy shale in which no marine fossils, as abundantly characterize the horizon in the Great Kanawha Valley, have yet been found. In **Middle Fork District** it is recorded in Cassity Fork Boom and Lumber Company No. 1 (16) Coal Test Boring as 27 feet thick and dark. In the same district a black shale deposit, 15 feet thick, was found on the head of Back Fork of Elk 0.8 mile southeast of Parting Springs that seems to represent it. This shale is exposed in the cut of the Alexander and Eastern Railroad but no fossils were certainly identified in it. There is a possibility, however, that these fossils may yet be found in Randolph County.

Lower War Eagle Coal.

The **Lower War Eagle Coal** of White[33] appears to be al-

[30] I. C. White, Bull. 65, U. S. Geol. Survey, p. 177 (1891); and Vol. II, W. Va. Geol. Survey, pp. 592-3 (1903).

[31] Ray V. Hennen and David B. Reger, Logan and Mingo Rept., W. Va. Geol. Survey, p. 211; 1914.

[32] I. C. White, Bull. 65, U. S. Geol. Survey, pp. 140 and 177 (1891); and Vol. II, W. Va. Geol. Survey, p. 593 (1903).

[33] I. C. White, Vol. II(A), W. Va. Geol. Survey, pp. 318 and 325; 1908.

most totally absent in Randolph County. In **Huttonsville District** the West Virginia Pulp & Paper Company No. 3 (52) Coal Test Boring records 6′ 10″ of slaty coal at its horizon but elsewhere it was not noted.

Lower Gilbert Sandstone.

The **Lower Gilbert Sandstone** of Hennen and Reger[34] is frequently absent but may be noted at various localities in southern Randolph, being 25 to 50 feet thick, gray and massive. In **Middle Fork District** the Elkhorn Coal Corporation No. 2 (26) Coal Test Boring records it as 32 feet thick. In **Beverly District** the Bemis Section shows it to be 55 feet thick, massive, pebbly, and making a cliff. In **Valley Bend District** the Cheat Junction Section records it as a massive cliff rock, 38 feet thick. In **Huttonsville District** the Ward & Hutton No. 2 (66) Coal Test Boring notes it as 21 feet thick; the West Virginia Pulp & Paper Company No. 1A (50) shows it 40 feet, the No. 4 (53) of the same company shows 32 feet, and the No. 10 (61) gives 71′ 10″ of pebbly sandstone at this horizon. In **Mingo District** it is recorded in the Hopkins Section as 10 feet and shaly; in the Ward & Hutton No. 1 (67) Coal Test Boring as 52′ 9″; in the Ward & Hutton No. 3 (68) as 26 feet; and in the West Virginia Pulp & Paper Company No. 1 (69) as 31′ 6″. In **Dry Fork District** the Bowden Section indicates it as 15 feet thick, gray, and massive.

So far as known this sandstone has not been quarried but in some of the southern localities it could doubtless be used for masonry structures if desired. In the Barbour, Upshur and Western Randolph Report this ledge was erroneously described as the "Upper Gilbert".

Gilbert Coal.

The **Gilbert Coal** of Hennen and Reger[35], coming next under the Lower Gilbert Sandstone in Randolph County, is widely persistent except toward the north and should eventually furnish a considerable amount of commercial fuel. Generally it is 200 to 250 feet above the Sewell Coal but the interval varies considerably in various parts of the county, as has been indicated in the Table of Intervals Above and Below the Sewell Coal, page 119. Its supposed minable extent is indicated on Figure 25 and its outcrop for the same territory is delineated on Map II.

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[34]Ray V. Hennen and David B. Reger, Logan and Mingo Rept., W. Va. Geol. Survey, p. 219; 1914.

[35]Ibid., pp. 221-2.

Dotson Sandstone.

The **Dotson Sandstone** of Campbell[36], belonging a few feet under the Gilbert Coal, is poorly represented in Randolph County, being often absent by disconformity. When present it varies from 10 to 30 feet in thickness and is gray and massive. In **Beverly District** it is recorded in the Bemis Section as 10 feet thick and thin-bedded. In **Huttonsville District** the West Virginia Pulp & Paper Company No. 1A (50) Coal Test Boring shows it to be 23 feet thick. In **Mingo District** the No. 1 (69) Boring of the same company records it in connection with the Nuttall Sandstone with a combined total of 136 feet.

Douglas Coal.

The **Douglas Coal** of Hennen[37], belonging a few feet below the Dotson Sandstone, apparently has little representation in Randolph County. It was not observed at outcrop at any point but at certain coal test borings of the West Virginia Pulp & Paper Company in **Huttonsville District** a coal is found which seems to belong at its horizon. In No. 1A (50) it is 0′ 10″ thick; in No. 8A (58) it is 7′ 2″, but shaly; in No. 9 (60) it is 4′ 0″, but bony; and in No. 10 (61) it is 1′ 1″. There is little possibility that this seam will furnish any minable coal.

Lower Dotson Sandstone.

The **Lower Dotson Sandstone** of Hennen[38], belonging below the Douglas Coal, is seldom found in Randolph County, being usually absent by disconformity or represented by sandy shale. In some localities, however, a sandstone 5 to 15 feet thick, gray or brown, and massive, occurs at this horizon. In **Huttonsville District** the Mill Creek Section, page 164, records it as five feet thick and brown. In **Mingo District** the Valley Head Section, page 171, shows it to be 15 feet thick and massive.

Douglas Shale.

The **Douglas Shale** of Hennen[39], coming next below the Lower Dotson Sandstone, has been recognized at only a few points in Randolph County, being absent by reason of disconformity in many localities and elsewhere difficult of cor-

[36]M. R. Campbell, Tazewell Folio, No. 44, U. S. Geol. Survey, 1898.

[37]Ray V. Hennen, Wyoming-McDowell Rept., W. Va. Geol. Survey, p. 181; 1915.

[38]Ibid., pp. 274-5.

[39]Ibid., pp. 183-4.

PLATE XXIII.—View from Back Allegheny-Shavers Mountain gap along Staunton and Parkersburg Pike, looking west down Blister Run and across Shavers Fork toward White Top and Cheat Mountain. Immediate foreground is Mauch Chunk topography covered by spruce and fir (blister pine) timber. Higher mountain slopes are Pottsville.
(Photo. by E. E. Harris.)

PLATE XXIV.—View from Rich Mountain west of Job looking northeast down valley of Dry Fork of Cheat. In left background is a low shoulder west of the Roaring Plains made by Mauch Chunk Series. High top in middle is Brierpatch Mountain of Allegheny, capped by Pottsville with entire Mauch Chunk below. At right is western slope of Job Knob, mostly Mauch Chunk. Greenbrier Series outcrops in bluffs along river. (Photo by E. E. Harris.)

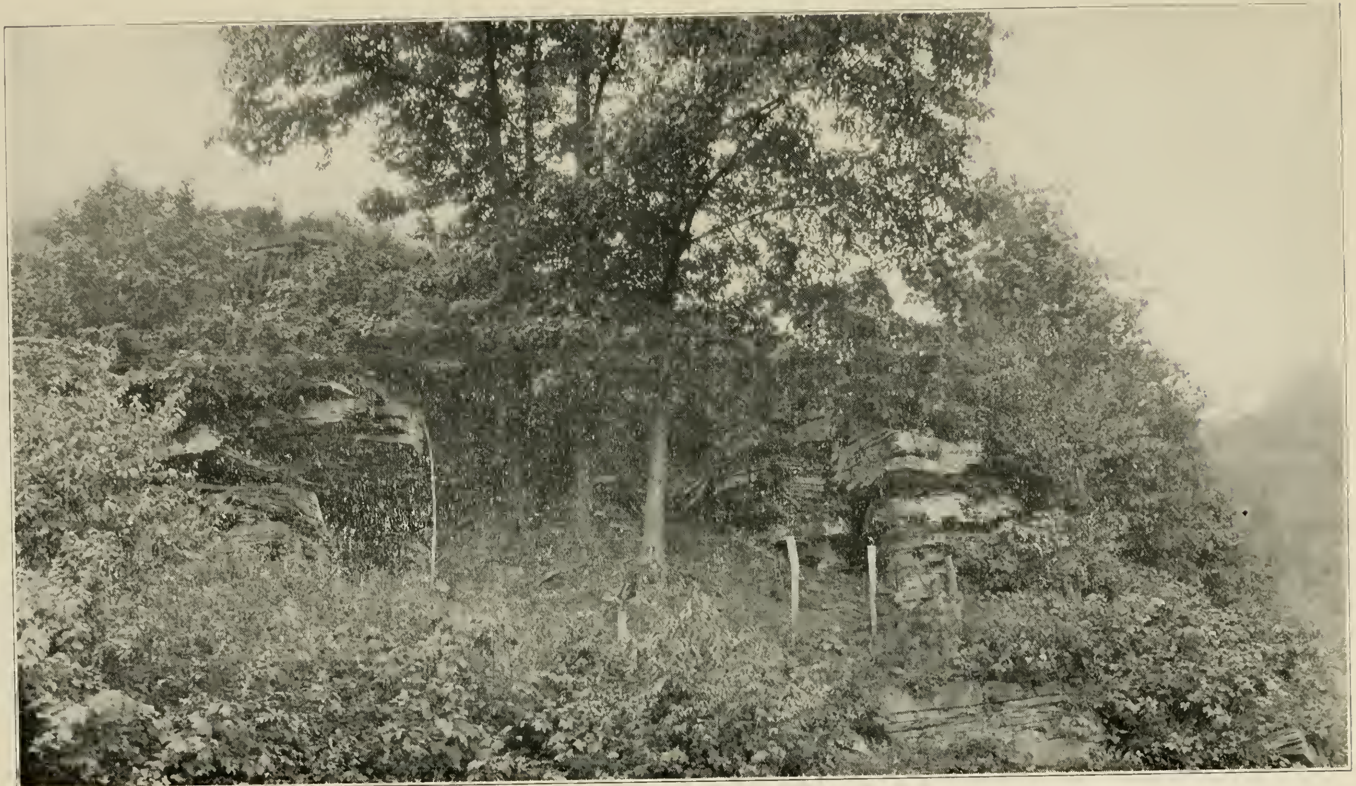

PLATE XXV.—A Mauch Chunk Sandstone, probably Bradshaw, on Rich Mountain road west of Job. (Photo. by E. E. Harris.)

PLATE XXVI.—Mauch Chunk topography at base of Gregg Knob northwest of the mouth of Gandy Creek near Whitmer. Cliff at left is Droop Sandstone and lower ledge slightly visible among trees at right is Webster Springs. (Photo. by E. E. Harris.)

relation on account of the general shaly character of the older members of the Kanawha Group. When present it is dark, sandy, and laminated, with an average thickness of only about five feet. In **Huttonsville District**, however, a dark, sandy shale 35 feet thick appears at its horizon in the Mill Creek Section, page 164. No trace of the brackish-water fauna which characterizes it in some of the southern counties was observed.

Lower Douglas Coal.

The **Lower Douglas Coal** of Hennen[40], coming next under the Douglas Shale, appears to be represented in Randolph County by a bed of soft coal that sometimes reaches a thickness of two feet or more but that is so lenticular that it offers no hope of commercial exploitation. At a few points it may furnish a small amount of local domestic fuel.

In **Valley Bend District** the following prospect was observed:

West Virginia Pulp & Paper Company Prospect—No. 158 on Map II.

On south side of Fishinghawk Creek 0.8 mile south of forks and 1.3 miles southwest of Bemis; **Lower Douglas Coal**; elevation, 2140′ B.

		Ft.	In.
1.	**Sandstone, Lower Dotson**, gray	20	0
2.	**Shale, Douglas**, dark	6	0
3.	**Coal, soft**	2	6
4.	Shale, dark and concealed to creek	15	0
5.	**Sandstone, Nuttall**, massive	--	--

This exposure illustrates quite well the nature of early sedimentation in the Kanawha Group, as the Nuttall Sandstone is the youngest member of the New River.

In **Huttonsville District** the coal was once opened at the **West Virginia Pulp & Paper Company Prospect (No. 159 on Map II)**, located along the Staunton and Parkersburg Pike 0.8 mile northwest of Cheat Bridge at elevation 3893′ L., as exhibited in the Cheat Bridge Section, page 167. This prospect had fallen shut and no report was obtained as to the thickness of the coal. In the same district the Mill Creek Section, page 164, records the blossom of this coal at elevation 3180′ B.

In **Mingo District** this bed is visible at **Coal Exposure No. 160 on Map II** along the State road at the eastern end of Point Mountain 2.9 miles west of Monterville, being 1′ 3″ thick at elevation 3810′ B., as exhibited in the Valley Head

[40]Ibid., p. 184-5.

Section, page 171. In the same district it is noted in the Ward & Hutton No. 3 (68) Coal Test Boring as 1′ 8″ thick.

In Dry Fork District it was opened by the writer with local assistance at the following prospect:

West Virginia Improvement Company Prospect—No. 161 on Map II.

On western side of Big Knob of Shavers Mountain 1.7 miles east of Bowden; Lower Douglas Coal; elevation, 3465′ B.

	Ft.	In.
1. Sandstone, Lower Dotson, visible	2	0
2. Coal, clean, soft	1	10
3. Fire clay shale, pavement	--	--

DESCRIPTION OF MEMBERS, NEW RIVER GROUP OF POTTSVILLE SERIES.

Upper Nuttall Sandstone.

The Upper Nuttall Sandstone of Hennen[41], which is a subdivision of the earlier Nuttall Sandstone of Campbell and White[42], forms the upper member of the New River Group almost all the way from the Kentucky and Virginia State lines northeastward to Randolph County. In Randolph and Webster Counties, however, it is sometimes merged with the Lower Nuttall without intervening shales or coals so that it has frequently been necessary to refer to the combined ledge as the Nuttall Sandstone. When distinguishable as a separate member it is gray, massive, sometimes pebbly, and varies in thickness from 10 to 50 feet, being generally 30 feet or less. In Middle Fork District the Cassity Fork Boom and Lumber Company No. 1 (16) Coal Test Boring records 40 feet of combined Nuttall Sandstone and the No. 2 (17) of the same company shows 29 feet.

In Beverly District it is apparently the Nuttall that makes the northern rim rock of Pond Lick Mountain at the head of Mike Run southwest of Bowden at elevation 3900′ B., forming a massive cliff, 60 feet thick and holding up the extreme summit of the mountain which is 4005′. In the Bemis Section, page 160, it is recorded as 80 feet thick, white, massive, and pebbly, and forming a conspicuous cliff at 3040′ B. along the old Bemis Railroad grade which is now a county road. In the old abandoned county road which formerly ascended Cheat Mountain between the forks of Fishinghawk

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[41]Ray V. Hennen, Fayette Report, W. Va. Geol. Survey, pp. 295-6; 1919.

[42]I. C. White, Bull. 65, U. S. Geol. Survey, p. 200 (1891); Vol. II, pp. 616 and 655 (1903) and Vol. II(A), pp. 253-4 (1908), W. Va. Geol. Survey; and M. R. Campbell, Raleigh Folio, No. 77, U. S. Geol. Survey, 1902.

Creek it is 35 feet thick and pebbly, at elevation 2945′ B. Both these exposures apparently represent the combined Nuttalls.

In **Valley Bend District** the combined Nuttall ledge is exposed along the bed of Fishinghawk Creek one-half mile south of the forks, having a thickness of more than 100 feet and an elevation of 2970′ B. In the Cheat Junction Section, page 162, the same combination is recorded as 27 feet thick, massive, and forming a cliff.

In **Huttonsville District** the Mill Creek Section, page 164, shows the combined ledge as 35 feet thick, yellowish-gray or pinkish. The Cheat Bridge Section, page 167, records the combined formation as 44 feet, only four feet being entirely visible. The same combination is reported in several of the West Virginia Pulp & Paper Company Coal Test Borings. In No. 1A (50) it is 110 feet; in No. 4 (53) it is 50 feet; in No. 5 (54) it is 52 feet; and in No. 8A (58) it is 24′ 10″. In the Ward & Hutton No. 2 (66) Coal Test Boring near the head of Mill Creek it is 85 feet.

In **Mingo District** the Ward & Hutton No. 1 (67) Coal Test Boring records the Upper Nuttall as a separate ledge 55 feet thick. The Whitaker Falls Section, page 183, shows the same separate ledge as 50 feet thick, massive, and pebbly. The West Virginia Pulp & Paper Company No. 1 (69) Coal Test Boring records 136 feet of rock which appears to be a combination of Dotson and Nuttall.

In **Dry Fork District** the combined Nuttall is visible at various points. The Bowden Section, page 189, records it as 60 feet thick, gray, massive, coarse, and making a cliff. On Middle Ridge west of Taylor Run its top was noted twice at elevations 3375′ B. and 3395′ B. Farther south it is a conspicuous cliff forming the eastern rim rock of Shavers Mountain west of Wheeler where it is about 75 feet thick.

Quarries were not observed in the Upper Nuttall, or in the combined Nuttall, but without doubt enormous quantities of good stone for masonry structures could be obtained from the formation, although generally its outcrops are not easily accessible to transportation. At Bemis and doubtless at other points it can be reached without great difficulty.

Iaeger "B" Coal.

The **Iaeger "B" Coal** of Hennen[43], coming a few feet below the Upper Nuttall Sandstone, is usually absent in Randolph County on account of the northern thinning and coalescence of the measures. It was not observed at outcrop

[43]Ray V. Hennen, Wyoming-McDowell Rept., W. Va. Geol. Survey, pp. 186-7; 1915.

but in **Huttonsville District** the Ward & Hutton No. 2 (66) Coal Test Boring records it as 4' 6" thick and shaly. In **Mingo District** the Ward & Hutton No. 1 (67) Coal Test Boring shows it as 1' 2" thick.

Lower Nuttall Sandstone.

The **Lower Nuttall Sandstone** of Hennen[44], as finally differentiated, appears to be a separate edge only in the southern end of Randolph County where it is gray, massive, and sometimes pebbly, with a thickness of 25 to 50 feet. Farther north, in the central part of the county, it is combined with the Upper Nuttall and still farther north the separate sandstones and the combined Nuttall ledge can seldom be recognized. In **Roaring Creek District** the Lower Nuttall is correlated in the P. J. Cain No. 1 (13) Coal Test Boring, its thickness being 23' 4". In **Middle Fork District** it is noted as a separate ledge in the Cassity Fork Boom and Lumber Company No. 3 (18) Coal Test Boring, with a thickness of 28 feet. In **Huttonsville District** it is correlated as a separate ledge in the West Virginia Pulp & Paper Company No. 9 (60) Coal Test Boring where it is 24' 8" thick. In **Mingo District** the Valley Head Section, page 171, shows it to be 25 feet thick and massive; and the Whitaker Falls Section, page 183, records it as 100 feet thick but partly concealed. The Ward & Hutton No. 1 (67) Coal Test Boring gives it as 30' 6" and the Ward & Hutton No. 3 (68) shows it to be 16 feet.

Elsewhere in the county the Lower Nuttall is recorded mostly as a combined ledge with the Upper Nuttall as already described under the discussion of the latter sandstone. Its characteristics are much the same as the Upper Nuttall and the same remarks relative to its availability for building stone app'y without essential difference.

Upper Iaeger Shale.

The **Upper Iaeger Shale** of Hennen[45], belonging just under the Lower Nuttall Sandstone and forming the roof of the Hughes Ferry Coal, which in some of the southern counties is known as the Iaeger, is frequently visible, being dark, sandy, and varying in thickness from two to five feet. In **Beverly District** it is recorded in the Bemis Section, page 160, as five feet thick, dark, and sandy. In **Huttonsville District** the Mill Creek Section, page 164, shows it as five feet thick, and dark. In **Mingo District** the Valley Head Sec-

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[44]Ray V. Hennen, Fayette Rept., W. Va. Geol. Survey, pp. 297-9; 1919.

[45]Ray V. Hennen, Wyoming-McDowell Rept., W. Va. Geol. Survey, pp. 188-9; 1915.

tion, page 171, records it as 20 feet but partly concealed. The Ward & Hutton No. 1 (67) Coal Test Boring notes it as four feet thick, dark, and sandy; and the Ward & Hutton No. 3 (68) as 2′ 3″, and dark. Elsewhere in the county it is noted in the descriptions of the bed-sections of the Hughes Ferry Coal as recorded in Chapter X.

Hughes Ferry Coal.

The **Hughes Ferry Coal** of White[46], coming just under the Upper Iaeger Shale and only a few feet beneath the Lower Nuttall Sandstone, and being usually 200 feet or more above the Sewell Coal, although this interval varies from 70 feet at Norton to a maximum of 240 feet at Whitaker Falls, is a widely persistent member of the New River Group. Generally it is soft, columnar, and single-bedded with a thickness ranging from one to three feet. In **Roaring Creek District** its stratigraphic position is exhibited in the Norton Section, published in Chapter V; in **Middle Fork District** by the Cassity, Adolph, Big Laurel Thicket, and Hartridge Sections; in **Huttonsville District** by the Cheat Bridge and Mill Creek Sections; in **Mingo District** by the Valley Head Section; and in **Dry Fork District** by the Otter Creek Section (in Tucker County).

The supposed minable extent of this coal is indicated on Figure 26 and on Map II its outcrop for the same area is delineated. Its further discussion, together with descriptions of bed-sections, chemical analyses, and estimates of tonnage, will be found in Chapter X under the subject of "Commercial Coal."

Middle Iaeger Sandstone.

The **Middle Iaeger Sandstone** of Hennen[47], mostly filling the gap between the Hughes Ferry and Lower Iaeger Coals, is of small importance in Randolph County, being occasionally visible as a gray, massive ledge, 10 to 25 feet thick. In **Middle Fork District** it is noted in the Adolph Section, page 138, as 32′ 6″ thick and gray; and in the Elkhorn Coal Corporation No. 2 (23) Coal Test Boring it is 29′ 6″.

Lower Iaeger Coal.

The **Lower Iaeger Coal** of Hennen[48], belonging almost immediately under the Middle Iaeger Sandstone, was noted at a few points in the county but apparently has little con-

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[46]I. C. White, Vol. II(A), W. Va. Geol. Survey, pp. 252-3; 1908.

[47]Ray V. Hennen, Wyoming-McDowell Rept., W. Va. Geol. Survey, p. 190; 1915.

[48]Ibid., p. 190.

tinuity or value. When found it varies from one to two feet in thickness, being soft and columnar like the other New River Coals. In **Roaring Creek District** it is recorded in the Maxwell & Crawford No. 2 (2) Coal Test Boring as 0′ 5″ thick. In **Middle Fork District** it is noted in the Hartridge Section, page 140, as 1′ 6″ thick. In the same district several of the Elkhorn Coal Corporation coal test borings record it. In the No. 2 (23) it is 0′ 3″; in the No. 3 (27) it is 0′ 3″; in the No. 4 (28) it is 0′ 3″; in the No. 5 (29) it is 1′ 3″; and in the No. 2 (26) it is 1′ 1″. The **Holly Lumber Company Prospect (No. 195 on Map II)**, located on Zimmerly Run of Back Fork of Elk River, 1.8 miles south of the Parting Springs, reveals a thickness of 1′ 11″ at an elevation of 3120′ B.

In **Huttonsville District** certain of the coal test borings of the West Virginia Pulp & Paper Company on Shavers Fork show its horizon. The No. 1A (50) gives it as 0′ 10″; the No. 8A (58) shows it as 7′ 4″, but shaly; the No. 8B (59) records only 0′ 6″; and the No. 9 (60) has only 0′ 2″. The following exposure was noted along Mill Creek:

Coal Exposure—No. 196 on Map II.

On west side of Mill Creek 0.7 mile southwest of Glade Run and 7 miles southwest of Mill Creek town; **Lower Iaeger Coal**; elevation, 2835′ B.

		Ft.	In.
1.	Sandstone, shaly, and sandy shale	100	0
2.	Shale, dark, sandy, with thin streaks of coal and iron nodules	25	0
3.	Sandstone, massive	1	6
4.	**Coal**	1	2
5.	Fire clay shale in creek	--	--

In **Mingo District** the coal was noted in the Ward & Hutton No. 1 (67) Coal Test Boring as 0′ 1″ thick, and in the Ward & Hutton No. 3 (68) as 0′ 6″.

Lower Iaeger Shale.

The **Lower Iaeger Shale** of Hennen[49], belonging just under the Lower Iaeger Coal, appears to be present at a few localities in southern Randolph but is difficult of certain recognition. Generally it is a dark, sandy shale with no special features and with a thickness of only a few feet, although this is subject to variation. In **Valley Bend District** it is noted in the Cheat Junction Section, page 162, as 44 feet thick, dark in color, but partly concealed. In **Mingo District** it is recorded in the Ward & Hutton No. 3 (68) Coal Test Boring as 12′ 6″ thick.

[49]Ibid., pp. 191-2.

Harvey Sandstone.

The **Harvey Conglomerate** of Campbell[60], more commonly known as the **Harvey Sandstone**, belongs below the Lower Iaeger Shale and only a few feet above the Castle Coal from which it is separated by the Sandy Huff Shale. In a considerable part of Randolph County it is a persistent and heavy ledge, being usually gray or brown and massive, with a thickness varying from 15 to 50 feet. In **Roaring Creek District** it is recorded in the James Curtis No. 1 (1) Coal Test Boring as 61′ 10″ thick, and in the Maxwell and Crawford No. 2 (2) Coal Test Boring as 16′ 3″ thick and conglomeratic. In **Middle Fork District** it is noted in the Adolph Section, page 138, as 14′ 9″, and gray and shaly. In the Cassity Fork Boom and Lumber Company No. 1 (16) Coal Test Boring it is 21 feet thick. In **Valley Bend District** it is recorded in the Cheat Junction Section, page 162, as 28 feet thick, and massive. In **Huttonsville District** the Cheat Bridge Section shows it to be 48 feet thick and massive; and the Mill Creek Section notes it as 25 feet thick, massive at the top but shaly at the base. The Ward & Hutton No. 2 (66) Coal Test Boring records it as 21 feet. Several of the West Virginia Pulp & Paper Company borings on Shavers Fork note its presence. In the No. 1A (50) it is 22 feet thick; in the No. 4 (53) it is 42 feet; in the No. 5 (54) it is 38 feet; in the No. 8B (59) it is two feet; in the No. 12 (63) it is 62′ 6″, dark and pebbly; and in the No. 14 (65) it is 16′ 4″ thick, and hard.

In **Mingo District** it is recorded in the Valley Head Section as 45 feet thick, and making a massive cliff; and in the Whitaker Falls Section as 30 feet. The Ward & Hutton No. 1 (67) Coal Test Boring shows it as 26 feet thick, and shaly; and the Ward & Hutton No. 3 (68) records it as 21 feet. In **Dry Fork District** the Bowden Section records it as 10′ thick, brown, and massive. On Middle Ridge, facing a branch of Taylor Run, it was noted as 25 feet thick, hard, and massive, at elevation 3280′ B. In the valley of Dry Fork the Job Knob Section shows it as forming the top of this knob, being 40 feet thick, coarse, and massive; and the Haines Knob Section records it as 50 feet, massive, and pebbly.

So far as known this ledge has not been quarried in the county but if necessary it could furnish a large amount of stone for masonry structures. Various other exposures will be noted in connection with the Castle Coal in Chapter X.

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[60]M. R. Campbell, Raleigh Folio, No. 77, U. S. Geol. Survey; 1902.

Sandy Huff Shale.

The **Sandy Huff Shale** of Hennen[51], coming next under the Harvey Sandstone, which is usually a dark-gray, argillaceous formation with a thickness that seldom exceeds five feet in Randolph County, is not conspicuous but may be noted in the southern part of the county. In **Huttonsville District** it is recorded in the Mill Creek Section as one foot thick, and dark. In **Mingo District** the Ward & Hutton No. 3 (68) Coal Test Boring shows it to be five feet thick, and dark. Various other exposures will be noted in connection with the description of the Castle Coal in Chapter X.

Castle Coal.

The **Castle Coal** of Hennen[52], coming just under the Sandy Huff Shale and only a few feet above the Guyandot Sandstone, and with an interval above the Sewell Coal which varies from 50 to 150 feet depending on the locality, is a persistent bed in the southern part of the county, being soft and columnar in structure and usually though not always single-bedded. It is of excellent quality and will eventually furnish a considerable amount of fuel. Figure 27 shows its supposed minable extent, but its outcrop is not delineated on Map II as its approximate position may be closely inferred from its relationship to the Hughes Ferry above, and the Sewell below. Its further discussion, together with bed-sections, chemical analyses, and estimates of tonnage will be found in Chapter X under the subject of "Commercial Coal".

Guyandot Sandstone.

The **Guyandot Sandstone** of Campbell[53], belonging a few feet below the Castle Coal, is a grayish-white, massive ledge, varying in thickness from 10 to 50 feet and usually being very hard and durable. In **Middle Fork District** its stratigraphic position and character are exhibited in the measured sections of Chapter V for Cassity where it is 25 feet thick and massive; for Laurel Branch of Middle Fork where it is 23′ 6″, and gray; and for Adolph where it is 10′ 9″, gray, and slaty. It is also recorded in several of the coal test borings of the Elkhorn Coal Corporation. In the No. 9 (33) it is 20′ 6″; in the No. 4 (28) it is 17′ 6″; in the No. 5 (29) it is 40 feet; and in the No. 8 (32) it is 18 feet thick.

In **Huttonsville District** it is noted in the Mill Creek Sec-

[51]Ray V. Hennen, Wyoming-McDowell Rept., W. Va. Geol. Survey, p. 193; 1915.

[52]Ibid., pp. 193-4.

[53]M. R. Campbell, Raleigh Folio, No. 77, U. S. Geol. Survey; 1902.

tion, page 164, as 30 feet thick and massive. It is also reported in several of the West Virginia Pulp & Paper Company coal test borings on Shavers Fork. In the No. 1A (50) it is six feet; in the No. 5 (54) it is six feet; in the No. 8A (58) it is 37′ 6″; in the No. 8B (59) it is 7′ 7″; in the No. 9 (60) it is 5′ 4″; in the No. 11 (62) it is 9′ 6″; and in the No. 13 (64) it is 2′ 7″.

In **Mingo District** it apparently forms the top of Snyder Knob of Cheat Mountain, being 65 feet thick, white, and massive as recorded in the Snyder Knob Section, page 174. On the same mountain it is recorded in the West Virginia Pulp & Paper Company No. 1 (69) Coal Test Boring as 40 feet thick. West of Tygart Valley it is noted in the Ward & Hutton No. 1 (67) Coal Test Boring as 13′ 9″ and in the Ward & Hutton No. 3 (68) as 2′ 6″.

So far as known this ledge has not been quarried in the county but its massive and durable character should make it suitable for masonry structures where long life is desired.

Skelt Shale.

The **Skelt Shale** of Reger[51], belonging between the Guyandot Sandstone and Sewell "B" Coal, is usually a dark-gray, fissile stratum, seldom more than five feet thick but of considerable importance because it is one of the few definitely marine horizons of the New River Group. At its type locality near Skelt, Webster County, it carries **Orbiculoidea capuliformis, Naiadites elongata,** ostracods, and other forms too poorly preserved for identification according to Dr. W. Armstrong Price who examined the collection of the writer. In more recent years the writer made a similar but rather more abundant collection from the same horizon at an elevation of 2450′ B. on the first western branch of Easy Run of Back Fork of Elk in the same portion of Webster County but unfortunately this collection appears to have been mislaid.

In Randolph County no fossils were observed in this formation but in **Beverly District** the shale is recorded in the Bemis Section, page 160, as three feet thick, dark, and sandy. In Huttonsville District it is noted in the Ward & Hutton No. 2 (66) Coal Test Boring as six feet thick. In Mingo District the Valley Head Section, page 171, shows it to be 30 feet thick; and the Ward & Hutton No. 1 (67) Coal Test Boring records it as 3′ 9″ thick, and dark.

It is probable that a more patient search of this shale in Randolph County would reveal its fossils which are of considerable scientific importance. The descriptions of bed-

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[51]David B. Reger, Webster County Report, W. Va. Geol. Survey, p. 198; 1920.

sections of the Sewell "B" Coal, as hereinafter published, will give a good idea as to the most hopeful localities.

Sewell "B" Coal.

The **Sewell "B" Coal** of Hennen[55], coming just below the Skelt Shale and usually 40 to 50 feet above the Sewell Coal, has been noted at numerous localities in southern Randolph, being soft and columnar and in rare instances having a thickness of two feet. As a rule, however, it is seldom much more than one foot thick and while the coal is of good quality and may furnish local fuel at certain localities, it offers little hope for commercial exploitation.

In **Roaring Creek District** this coal is reported in the P. J. Cain No. 1 (13) Coal Test Boring as 0′ 3″ thick; and in the Maxwell & Crawford No. 2 (2) Coal Test Boring as 1′ 6″ thick, and bony.

In **Middle Fork District** the measured sections of Chapter V report it in the Cassity Section as 0′ 6″ thick at elevation 2116′ L.; in the Laurel Branch of Middle Fork Section as 1′ 8″ thick, and slaty; in the Adolph Section as 0′ 4½″ thick; and in the Hartridge Section as 0′ 7″. Several of the Elkhorn Coal Corporation coal test borings also record its presence. In the No. 2 (23) it is 0′ 3″; in the No. 2 (26) it is 0′ 3″; in the No. 3 (27) it is 0′ 5″; in the No. 5 (29) it is 1′ 2″; in the No. 7 (31) it is 1′ 0″; and in the No. 9 (33) it is 0′ 7″. It is also visible several feet above the Sewell Coal in the roof shales of the Beech Run Mine **(No. 266 on Map II)** as hereinafter described under the Sewell Coal where it is 2′ 4″ thick. The following prospect is reported by Teets:

Elkhorn Coal Corporation Prospect—No. 217 on Map II.

On Left Fork of Buckhannon River 1.1 miles southwest of Star; Sewell "B" Coal; elevation, 2740′ B.

		Ft.	In.
1.	Slate, black, visible	8	0
2.	Coal, Sewell "B", soft (2740′ B.)	2	5
3.	Concealed to Sewell Coal	47	0

A sample collected from this opening is published under **Mine No. 217** in the Table of Coal Analyses at the end of this Chapter.

Farther south, in **Mingo District**, the coal is exposed at the **Davis & Elkins Prospect (No. 218 on Map II)** at the head of Hewett Fork of Back Fork of Elk 2.5 miles northwest of Monterville, at elevation 3720′ B., being 25 feet above a closely adjacent opening in the Sewell bed. This prospect show-

[55]Ray V. Hennen, Wyoming-McDowell Rept., W. Va. Geol. Survey, pp. 195-6 and 535-41; 1915.

ed two feet of clean coal and may not have represented the full thickness as it was not dug far into the mountain. At the **Davis & Elkins Exposure (No. 229 on Map II)**, along the State road at the eastern end of Point Mountain 2.1 miles west of Monterville the blossom of this coal measures 2′ 8″ at elevation 3620′ B., as recorded in the Valley Head Section, page 171, but according to George B. Swecker it has a full thickness of 2′ 10″. At the Ward & Hutton No. 1 (67) Coal Test Boring it shows 9′ 6″, but is slaty; and at the Ward & Hutton No. 3 (68) it is 10′ 0″, with bony partings. In the West Virginia Pulp & Paper Company No. 1 (69) Coal Test Boring near the Hopkins Mine on Shavers Fork it is 1′ 3″ thick, and slaty.

In **Beverly District** the coal has recently been prospected at several points in the valley of Shavers Fork, as now described:

W. L. Camden Prospect—No. 219 on Map II.

On hill south of Upper Pond Lick, 0.5 mile southwest of Flint; Sewell "B" Coal; elevation, 3225′ B.

	Ft.	In.
1. Shale, black	2	0
2. Coal, soft, good	0	11
3. Shale, dark, pavement	--	--

At the **W. L. Camden Prospect (No. 220 on Map II)**, on the hill north of Red Creek, 0.7 mile southwest of Flint, the coal was found at elevation 3185′ B. but was only 0′ 2″ thick. At the **Davis Coal Land Company Prospect (No. 221 on Map II)** on the north side of Fishinghawk Creek, 0.4 mile northwest of Bemis, it was opened at 2905′ B., having a thickness of 2′ 4″, as exhibited in the Bemis Section, page 160.

Davis Coal Land Company Prospect—No. 222 on Map II.

On hill north of Fishinghawk Creek 0.6 mile west of Bemis; Sewell "B" Coal; elevation, 2875′ B.

	Ft.	In.
1. Soil	--	--
2. Coal, soft ....3′ 0″ } 3. Coal, bony ....0 4 }	3	4
4. Shale, gray, pavement	1	0
5. Sandstone, massive	--	--

Three prospects have been made on the hill between the forks of Fishinghawk Creek about 1.1 miles west of Bemis. The **Davis Coal Land Company Prospect (No. 223 on Map II)**, which is the most northern, had fallen shut but according to W. S. Brydon, Superintendent, it measured 1′ 11½″ of coal, 21′ under cover, its elevation being 2890′ B. The **Davis Coal Land Company Prospect (No. 224 on Map II)**, located 75 feet farther south, at elevation 2890′ B., was full of water but was reported as 1′ 7½″ at the face by Mr. Brydon. The **Davis Coal Land Company Prospect (No. 225 on Map II)**, slightly farther south and having an elevation of 2895′ B., measured 1′ 4″ near the outcrop, but according to Mr. Brydon its thickness at the face when the prospect was still open was 1′ 7″. In this locality the coal is usually covered by two feet or more of dark-gray shale which is probably the Skelt Shale.

In **Huttonsville District**, on the waters of Shavers Fork the Sewell "B" Coal has been recorded in several of the coal test borings of the West Virginia Pulp & Paper Company. In the No. 1A (50) it is 1′ 2″ thick; in the No. 8A (58) it is 0′ 9″ thick, and bony; in the No. 9 (60) it is 1′ 11″ thick, and shaly; in the No. 11 (62) it is 0′ 10″ thick, and bony; and in the No. 13 (64) it is 0′ 6″.

West of Tygart Valley in the same district it is recorded in the Ward & Hutton No. 2 (66) Coal Test Boring as 2′ 1″ thick, and bony. At the **Lincoln Currence Prospect (No. 226 on Map II)**, on the eastern slope of Rich Mountain facing Right Fork of Mill Creek 2.3 miles northwest of Mill Creek town, it was opened at elevation 2905′ B., but had fallen shut, being reported by Mr. Currence as having three feet of clean coal at the top with another foot of bony coal at the base, as indicated in the Mill Creek Section, page 164. At the **John F. Nydegger Prospect (No. 227 on Map II)**, on the west side of Mill Creek five miles southwest of Mill Creek town, the coal was opened at elevation 2745′ B. but had fallen shut. According to Mr. Nydegger it measured 1′ 10″, being covered with 10 feet of sandy shale, evidently the Skelt. The following exposure was noted farther up Mill Creek.

Coal Exposure—No. 228 on Map II.

On west side of Mill Creek 0.3 mile below Glade Run and about 6.3 miles southwest of Mill Creek town; **Sewell "B" Coal**; elevation, 2700′ B.

	Ft.	In.
1. Shale, black	0	6
2. Coal, bony	0	2
3. Sandstone, shaly	2	0
4. **Shale, Skelt**, dark, sandy, with plant roots	7	0
5. **Coal, Sewell "B"**, good	1	0
6. Shale, sandy, with numerous plant roots	5	0
7. **Sandstone, Lower Guyandot**, massive, in creek	-	-

In **Dry Fork District** the Sewell "B" Coal was once opened at the **Richard Chaffey Prospect (No. 230 on Map II)**, on Shavers Mountain 1.1 miles northeast of Bemis at elevation 3675′ B., coming 115 feet above the Fire Creek Coal. This opening had fallen shut but, according to Mr. E. E. Thompson, measured 1′ 2″.

Sewell "A" Coal.

The **Sewell "A" Coal** of Hennen[56], which belongs in the shales between the Sewell "B" Coal and Lower Guyandot Sandstone, is usually absent in Randolph County, being seldom more than one foot thick when found. In **Huttonsville District** it was noted at the **West Virginia Pulp & Paper Company Prospect (No. 231 on Map II)**, on the north side of Lambert Run 1.6 miles southwest of Cheat Bridge, at elevation 3800′ B., where it was once opened by Isaiah White. The place had fallen shut but, according to H. F. Cromer, measured 0′ 8″. In the West Virginia Pulp & Paper Company No. 1A (50) Coal Test Boring this coal is reported 0′ 3″ thick; and in the No. 13 (64) of the same company it is 0′ 3″. The seam appears to have no economic possibilities.

Lower Guyandot Sandstone.

The **Lower Guyandot Sandstone** of Hennen[57], belonging a few feet above the Sewell Coal, is often noticeable in southern Randolph County, being grayish-white, massive, coarse, and hard, with a thickness of 10 to 20 feet but in some localities being combined with the Guyandot to form a much heavier ledge. In **Roaring Creek District** it is recorded in the Norton Section, page 130, as 23′ 3″ thick, and gray. In **Middle Fork District** it is reported in the Laurel Branch of Middle Fork Section as 16′ 9″ thick, and conglomeratic; and in the Adolph Section as 16′ 6″, and gray. The Elkhorn Coal Corporation No. 2 (23) Coal Test Boring shows it 17′ 3″ thick; and the No. 7 (31) of the same company notes it as 15 feet. On Rich Mountain near the head of Panther Run it is 10 feet thick and contains small quartz pebbles.

In **Leadsville District** it is noted in the Aggregates Section, page 149, as 10 feet thick, and flaggy. In the Susan Darby No. 1 (43) Coal Test Boring it is recorded as 72 feet thick, gray, and partly shaly. In **Huttonsville District** it is exhibited in the Cheat Bridge Section, page 167, as nine feet thick, and shaly. It is also recorded in various coal test borings of the West Virginia Pulp & Paper Company. In the No. 1A (50) it is 13 feet thick, and shaly; in the No. 5 (54) it is 28 feet; in the No. 8A (58) it is 8′ 2″; in the No. 11 (62) it is 21 feet; in the No. 13 (64) it is 33′ 1″; and in the No. 14 (65) it is 17′ 8″. West of Tygart Valley it is recorded in the Ward & Hutton No. 2 (66) Coal Test Boring as four feet thick. In **Mingo District** the Ward & Hutton No. 1 (67) Coal Test Boring shows it as 10 feet; and the No. 3 (68) records

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[56] Ibid., p. 196.
[57] Ibid., pp. 196-7.

it as 11' 4", and shaly. In the Whitaker Falls Section, page 183, it is 65 feet thick, massive, and pebbly.

The thickness and character of this sandstone are further exhibited along with the descriptions of numerous bed-sections of the Sewell Coal in Chapter X. So far as known it has not been quarried but it would furnish good stone for masonry structures, many of which will be required in the future development of the Sewell Coal.

Hartridge Shale.

The **Hartridge Black Shale** of Reger[58], or **Hartridge Shale** as it is now more commonly called, occupies the interval between the Lower Guyandot Sandstone and the Sewell Coal. Generally it is dark and sandy, or often black and carbonaceous, fissile, and carrying numerous nodules of iron carbonate, its thickness varying from one to 20 feet with an average of five feet or less. In **Middle Fork District** it may be studied at its type locality at the **Hartridge Mine (No. 268 on Map II)**, at Hartridge on Left Fork of Buckhannon River, where it is black and fissile, 5 to 6 feet thick, and carries abundant specimens of **Naiadites elongata.** The same fossils were observed on Mill Creek 2.6 miles due west of Lee Bell in the roof of the Sewell Coal.

In **Leadsville District** it is recorded in the Laurel Ridge Section of Chapter V as dark, four feet thick, and containing plant fossils; and in the Aggregates Section as 10 feet thick, dark, and fissile. In **Beverly District** the Cheat Junction Section of Chapter V records it as 27 feet thick, and black, but partly concealed. In **Huttonsville District** various borings of the West Virginia Pulp & Paper Company show its thickness and character. In the No. 8A (58) it is 3' 9" and sandy; in the No. 8B (59) it is 25' 3" thick, and sandy; in the No. 9 (60) it is 23' 5" thick, and sandy; in the No. 11 (62) it is 7' 1"; in the No. 13 (64) it is 7' 8" thick, and sandy; and in the No. 14 (65) it is 21' 11". West of Tygart Valley the Ward & Hutton No. 2 (66) Coal Test Boring shows it as five feet thick, and sandy. In **Mingo District** the Ward & Hutton No. 3 (68) Coal Test Boring records it as 4' 4" thick; and the Whitaker Falls Section of Chapter V notes it as three feet thick, sandy, and ferruginous.

Further exposures of this shale are exhibited along with the descriptions of numerous bed-sections of the Sewell Coal in Chapter X. In many of these localities the lower portion of the shale next to the coal is filled with well-preserved plant fossils in which several collections were made by Dr. David

[58]David B. Reger, Barbour, Upshur and Western Randolph Rept., W. Va. Geol. Survey, pp. 288-90; 1918.

White and the writer. Among these are **Fossil Lots 403, 408, 412, 436, and 449.** Such identifications of these plants as have been made by Dr. David White will be found in Chapter XIV. At **Fossil Lot 405,** at the **Walkers New River Mine (No. 295 on Map II)** on the west side of Shavers Fork southwest of Montes, Dr. Tilton has identified **Naiadites elongata** from the collection made by Dr. White and the writer, as is duly recorded in Dr. Tilton's discussion in Chapter XV.

Sewell (Sharon) Coal.

The **Sewell Coal** of White[59], named from Sewell Mountain, Fayette County, West Virginia, is the most valuable and persistent seam of the entire Pottsville in Randolph County. As expressed in many previous reports of the writer, this coal appears to correlate with the **Sharon Coal** of western Pennsylvania, the conclusion being based on stratigraphic evidence and agreeing with a much earlier deduction to the same effect by Dr. David White, based on the evidence of fossil plants.

In Randolph County the Sewell (Sharon) Coal usually varies from two to five feet in thickness, generally having several inches of bony coal at the base but otherwise mostly consisting of pure coal except that in certain restricted localities a bony parting appears in the middle of this mining bench. Its supposed minable extent is indicated on Figure 28 and on Map II its outcrop is delineated. In Chapter V its stratigraphic position is exhibited in many measured sections. It has also been used as the basis of the green structure contours published on the same map for the region west of Tygart Valley and in the valleys of Otter Creek and Shavers Fork. In Chapter X, under the subject of "Commercial Coal", will be found its further discussion, together with descriptions of bed-sections, chemical analyses, and estimates of tonnage.

Welch Sandstone.

The **Welch Sandstone** of Hennen[60], coming a few feet below the Sewell Coal, is usually gray, sometimes massive and sometimes shaly, and 10 to 30 feet thick. Generally it is not a conspicuous horizon but it may be observed at various localities. In **Middle Fork District** it is recorded in the Cassity Fork Boom and Lumber Company No. 1 (16) Coal Test Boring where it is 37 feet thick. In **Leadsville District** it is re-

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[59]I. C. White, The Virginias, pp. 7-16 (January, 1885); Bull. 65, U. S. Geol. Survey, p. 197 (1891); and Vol. II, W. Va. Geol. Survey, pp. 657-665 (1903).

[60]Ray V. Hennen, Wyoming-McDowell Rept., W. Va. Geol. Survey, p. 198; 1915.

corded in the Aggregates Section of Chapter V, being 25 feet thick and making a pebbly cliff. In **Valley Bend District** it is noted in the Cheat Junction Section of Chapter V as 12 feet thick, coarse, and massive. In **Huttonsville District** the Mill Creek Section records it as a massive, pebbly cliff, 35 feet thick. In the Ward & Hutton No. 2 (66) Coal Test Boring it is 10 feet. On Shavers Fork the West Virginia Pulp & Paper Company No. 1A (50) Coal Test Boring shows it to be four feet thick and the No. 8A (58) of the same company records 33′ 1″.

In **Mingo District** the Ward & Hutton No. 1 (67) Coal Test Boring notes it as 6′ 6″ thick, and shaly; and the Whitaker Falls Section of Chapter V records it as 50 feet thick, and massive. In **Dry Fork District** the Bowden Section of Chapter V shows it to be 10 feet thick, gray and coarse.

Numerous other exposures of the Welch Sandstone are noted in Chapter X in connection with the descriptions of bed-sections of the Welch Coal. So far as known it has not been quarried and generally it would be less valuable than many other Pottsville ledges, although it could be used for masonry structures in certain localities.

Welch Coal.

The **Welch Coal** of White[61], coming a few feet under the Welch Sandstone and generally 25 to 60 feet below the Sewell Coal, is rather persistent through a considerable portion of Randolph, being often only one foot or less in thickness but in some localities thickening to a minable seam of three feet. In **Roaring Creek District** its stratigraphic position is exhibited in the measured sections for Norton and Aggregates; in **Leadsville District** by that for Laurel Ridge; in **Valley Bend District** by those for Bemis and Cheat Junction; in **Huttonsville District** by those for Cheat Bridge and Mill Creek; in **Mingo District** by that for Valley Head; and in **Dry Fork District** by those for Bowden and Job Knob. Figure 29 shows its supposed minable extent but its outcrop is not delineated on Map II as its position may be quickly inferred from the position of the Sewell outcrop. In Chapter X will be found its further discussion together with bed-sections and estimates of tonnage.

Upper Raleigh (Sharon) Sandstone.

The **Upper Raleigh Sandstone** of White[62], or the upper division of the **Raleigh Sandstone** of Campbell[63], which the

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[61] I. C. White, Vol. II, W. Va. Geol. Survey, pp. 666-7; 1903.
[62] I. C. White, Vol. II(A), W. Va. Geol. Survey, p. 198; 1908.
[63] M. R. Campbell, Raleigh Folio, No. 77, U. S. Geol. Survey; 1902.

writer has for many years had little hesitation in correlating with the **Sharon Conglomerate** of the Pennsylvania Survey, is a most conspicuous member of the Pottsville Series in Randolph County. Generally it is grayish-white, massive, and conglomeratic with pebbles of white quartz, red jasper, and other darker silicates, and with a thickness of 25 to 60 feet. Its pebbles are usually considerably rounded but never flattened and seldom much elongated, their size varying up to two inches or more in diameter.

In **Roaring Creek District** its thickness and stratigraphic position are recorded in the Norton Section of Chapter V where it is 73′ 7″ thick, gray, and conglomeratic. In **Middle Fork District** it is noted by the Lost Run of Middle Fork Section as 25 feet thick; by the Cassity Section as 26′ 11″ thick, and conglomeratic; by the Laurel Branch of Middle Fork as 81 feet; and by the Adolph Section as 89′ 4″ thick, gray, and shaly. In **Leadsville District** the Laurel Ridge Section shows it to be 25 feet thick, massive, and pebbly; and the Aggregates Section records it as 39 feet thick, massive, and pebbly, with a shale break. In **Beverly District** it is recorded in the Bemis Section as 40 feet thick, massive, and pebbly; and in the Beverly Section as 50 feet thick, white, massive, and pebbly. In **Valley Bend District** the Cheat Junction Section shows it to be 14 feet thick; and it makes a prominent cliff near the forks of Fishinghawk Creek and at many points along Shavers Fork above Cheat Junction. In **Huttonsville District** the Cheat Bridge Section records it as 40 feet thick, massive, and pebbly; and the Mill Creek Section notes it as 50 feet thick, massive, gray, and pebbly. On Shavers Fork it makes numerous exposures from Stonecoal Run northward to the District line. On Mill Creek west of Tygart Valley it forms the falls of the creek 0.7 mile below Glade Run. The Ward & Hutton No. 2 (66) Coal Test Boring records it as 39 feet thick. It is also noted in many of the West Virginia Pulp & Paper Company borings on Shavers Fork. In the No. 1A (50) it is 127 feet thick, with a slate break; in the No. 2 (51) it is 104 feet; in the No. 7 (56) it is 40 feet; in the No. 8A (58) it is 82′ 1″; in the No. 9 (60) it is 56′ 2″ thick and conglomeratic; in the No. 11 (62) it is 99′ 10″ thick, and conglomeratic; and in the No. 14 (65) it is 59′ 9″ thick, and conglomeratic.

In **Mingo District** the Upper Raleigh (Sharon) is noted in the Hopkins Section, its thickness being concealed; in the Mingo Section with a thickness of 60 feet; in the Slaty Fork Section with a thickness of 50 feet; in the Snyder Knob Section with a thickness of 40 feet; in the Valley Head Section with a thickness of 20 feet; and in the Whitaker Falls Section with a thickness of 100 feet. It is also noted in the Ward

& Hutton No. 1 (67) Coal Test Boring as 4′ 2″ thick; and in the Ward & Hutton No. 3 (68) as 20 feet. On Shavers Fork the West Virginia Pulp & Paper Company No. 1 (69) Coal Test Boring records it as 70′ 8″.

In **Dry Fork District** the Bowden Section gives it as 20 feet thick, but partly concealed; the Collett Gap Section as 15 feet, gray, coarse, and pebbly; the Hazelwood Section as 50 feet thick, making a white cliff; and the Haines Knob Section as 40 feet thick, and white.

Generally and without regard to district lines, it forms frequent escarpments along the summit of Laurel Ridge west of Leading Creek and farther south it does the same along Rich Mountain west of Tygart Valley. It makes many escarpments along the western crest of Cheat Mountain east of Tygart Valley and along the eastern crests of Shavers Mountain and Back Allegheny. In the edge of Pendleton County it makes the summit of Spruce Knob, the highest mountain of the State. Here it is a mere mass of conglomeratic pebbles.

So far as known the Upper Raleigh (Sharon) has not been quarried in the county and at many points it would be considered undesirable on account of its conglomeratic character, but in some localities where the pebbles mostly disappear it might be used to good advantage for masonry structures.

Little Raleigh Coal.

The **Little Raleigh Coal** of White[64], belonging just under the Upper Raleigh (Sharon) Sandstone, is of little consequence in Randolph County, being found at only a few localities and being slaty or thin so that it has no economic value. In **Roaring Creek District** it is noted in the Norton Section of Chapter V where it is represented by a bed of black slate, 3′ 5″ thick, with interbedded coal. In **Beverly District** it was observed at **Coal Prospect No. 415 on Map II,** along the old Bemis Railroad grade, now a county road, on the mountain west of Shavers Fork and 0.6 mile northwest of Bemis, where it measures 1′ 6″ at elevation 2870′ B., as indicated in the Bemis Section, page 161. In **Valley Bend District** it is noted in the Cheat Junction Section, page 163, where it is 0′ 6″ thick, being visible on the western side of Shavers Fork 1.6 miles southwest of Bemis.

Lower Raleigh Sandstone.

The **Lower Raleigh Sandstone** of White[65], belonging between the Little Raleigh and Beckley Coals, is seldom found

[64] I. C. White, Vol. II(A), W. Va. Geol. Survey, pp. 198-9; 1908.
[65] Ibid., pp. 198-9.

in Randolph County but when present is represented by about 15 feet of sandy shale and shaly sandstone. It was observed along Shavers Fork from Bemis southward for a few miles.

Beckley Coal.

The **Beckley Coal** of Campbell[66], belonging next under the Lower Raleigh Sandstone horizon, is nearly always absent in Randolph and when found is thin and slaty, being entirely worthless from an economic standpoint. In **Valley Bend District** it was observed at the **West Virginia Pulp & Paper Company Exposure (No. 416 on Map II)**, on the steep slope of Cheat Mountain west of Shavers Fork 1.6 miles southwest of Bemis where it is 0′ 10″ thick at elevation 2895′ B., as recorded in the Cheat Junction Section, page 163. In **Huttonsville District** it is recorded in the West Virginia Pulp & Paper Company No. 14 (65) Coal Test Boring, being 2′ 1″ thick, and slaty.

Quinnimont Sandstone and Shale.

The **Quinnimont Sandstone** of White[67], and the **Quinnimont Shale** of Campbell[68], occupying the interval between the Beckley and Fire Creek Coals, are almost entirely absent in Randolph County, being found only in a limited territory along Shavers Fork south of Bemis.

Fire Creek ("Quinnimont") Coal.

The **Fire Creek ("Quinnimont") Coal** of White[69], is found at numerous points in Randolph County, being soft and almost invariably double-bedded, with a thickness which varies from 0 to 5 feet. Its interval below the Sewell Coal varies from 80 to 125 feet. Generally it is found almost immediately under the Upper Raleigh (Sharon) Sandstone but in the valley of Shavers Fork south of Bemis certain lenticular members separate it from the sandstone. In **Beverly District** its position in the stratigraphy is exhibited in the Bemis Section as published in Chapter V. In **Valley Bend District** it is noted in the Cheat Junction Section. In **Mingo District** it is exhibited in the Valley Head Section. In **Dry Fork District** it is noted in the sections for Haines Knob, Hazelwood, Job Knob, and Stonecoal Run of Red Creek.

This coal is much higher in ash than the Sewell but in certain areas, notably on Shavers Fork south of Bemis and

[66]M. R. Campbell, Raleigh Folio, No. 77, U. S. Geol. Survey, 1902.
[67]I. C. White, Vol. II(A), W. Va. Geol. Survey, p. 13; 1908.
[68]M. R. Campbell, Raleigh Folio, No. 77, U. S. Geol. Survey; 1902.
[69]I. C. White, Bull. 65, U. S. Geol. Survey, p. 197 (1891); and Vol. II(A), W. Va. Geol. Survey, pp. 179-185 (1908).

in the Allegheny Mountain region between Laneville and Job, it is often thick enough for mining. Its supposed commercial area is indicated on Figure 30, and its outcrop is delineated on Map II for the same regions. In Chapter X will be found its further discussion, together with bed-sections, chemical analyses, and estimates of tonnage.

Little Fire Creek Coal.

The **Little Fire Creek Coal** of White[70], belonging a few feet below the Fire Creek Coal, was not observed at outcrop in Randolph County but in **Huttonsville District** it is noted in the West Virginia Pulp & Paper Company No. 14 (65) Coal Test Boring, where it is 0′ 9″ thick. As an economic resource it is entirely worthless.

ECONOMIC ASPECTS, POTTSVILLE SERIES.

From an economic standpoint the Pottsville Series is the most important subdivision of the exposed rock column of Randolph County. It contains eleven seams of coal which are, or will be, commercially minable in certain parts of the county. By name, in descending order, these are the Upper Mercer, Lower Mercer (Stockton), Quakertown (Winifrede), Campbell Creek (Peerless Bench), Eagle, Gilbert, Hughes Ferry, Castle, Sewell (Sharon), Welch, and Fire Creek. Of these the Sewell is preeminent, being somewhat thin at various points but being exceeded in purity and general excellence by few other coals in West Virginia or the whole world.

Aside from its coals, however, the rocks of the Pottsville Series are of no great known value. It has no fire clays of consequence in this county. Its sandstones could furnish an unlimited amount of stone for masonry structures but their chief virtue is durability rather than richness of texture or ease of preparation and if exploited they would suffer from unlimited competition from other stone of similar quality. It is possible that some of these ledges could be used for pulpstone and their critical scrutiny by this growing industry might be well worth while. Some of them might also be used for glass-sand and some have been so used, but generally they contain too much iron or alumina or too many quartz pebbles to make them desirable for such a purpose.

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[70] I. C. White, Vol. II(A), pp. 22 and 25; 1908.

CHAPTER VII.

STRATIGRAPHY—MISSISSIPPIAN ROCKS.

INTRODUCTION.

The rocks of the Mississippian Period outcrop over a very considerable portion of Randolph County and also underlie a vast area which is covered by the Pennsylvanian. West of the Rich Mountain range which lies west of Tygart Valley, and north of Point Mountain, the exposures are mainly confined to a few isolated localities in deeply eroded river valleys but south of Point Mountain, on Elk River and its tributaries, these areas widen. East of Rich Mountain they may be observed along the eastern slopes of Laurel Ridge and Rich Mountain, along the western slope of Cheat Mountain, at various extended localities along Shavers Fork of Cheat River, on the eastern slopes of Shavers and Back Allegheny Mountains, on both slopes and most of the summits of Rich Mountain west of Dry Fork, in the valley of Dry Fork itself, and in Little Middle Mountain and Allegheny Mountain. In descending order these rocks are subdivided as follows:

	Feet.
Mauch Chunk Series:	
Bluestone Group	25 to 300
Princeton Conglomerate	10 to 50
Hinton Group	125 to 400
Bluefield Group	140 to 650
Greenbrier Series	100 to 400
Maccrady Series	0 to 50
Pocono Series	0 to 225
Totals	400 to 2,075

Figures 4 and 5, published on pages 100-102, illustrate in more detail the general nature of the Mississippian rocks. Their description now follows in regular order.

MAUCH CHUNK SERIES.

GENERAL ACCOUNT AND SECTION, MAUCH CHUNK SERIES.

The Mauch Chunk Series of the Mississippian next underlies the Pottsville Series of the Pennsylvanian. Its thickness at the northwestern corner of the county hardly exceeds 300 feet but it increases to the south and southeast, becoming approximately 1400 feet along the Pocahontas County border. At the north it is composed in large part of red sandstones and red shales but toward the south some of the sandstones vary to greenish-gray or even to grayish-white quartzitic ledges. In the lower part of the series, also, there are several limestones, the shales are mostly dark-green and calcareous, and these members are usually marine. Coals and coaly shales are almost, but not entirely, absent but such coals as are found are thin and shaly and entirely without economic importance.

The following general section illustrates the nature of the Mauch Chunk stratigraphic column in Randolph County:

General Section of the Mauch Chunk Series for Randolph County.

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
Bluestone Group (25' to 300')			
1. Shales, partly red, partly green, and fissile; rare streaks of micaceous sandstone	25 to 300	300	300
Princeton Conglomerate (15' to 50')			
2. Sandstone, Princeton, usually greenish-gray, massive, very hard and conglomeratic with large quartz pebbles and with frequent inclusions of limestone and shale pebbles near base; toward northwest it becomes green, micaceous, and somewhat shaly, losing most of its pebbles; prominent on headwaters of Elk, on Shavers Fork and on Dry Fork	15 to 50	350	50
Hinton Group (160' to 400')			
3. Shale, Terry Shale and Limestone, mostly greenish-gray, sandy shale, with streaks of ferruginous limestone; carries abundant marine fossils on Fishinghawk Creek and Shavers Fork near Bemis, brachiopods (including Orthotetes, Productus, and Lingula?), pelecypods (see Lots 309 and 379)	15 to 30	380	
4. Shale, Pluto, dark, sandy, carbonaceous; contains marine and plant fossils on Leatherwood Creek near Bergoo, Webster County; none observed in Randolph	2 to 4	384	
5. Coal, Pluto, lenticular, shaly, and impure; visible along Point Mountain road	0 to 1	385	35
6. Limestone, Pluto, red and shaly or siliceous; visible on Point Moun-			

	Thick-ness. Feet.	Total. Feet.	Inter-vals. Feet.
tain road; contains marine fossils near Cheat Junction	3 to 5	390	
7. **Shale, Lower Pluto**, red or greenish-brown and sandy; carries marine fossils in southern counties; not observed in Randolph	5 to 15	405	
8. **Sandstone, Falls Mills**, green, micaceous, and flaggy or shaly	5 to 15	420	35
9. Shales, red or green, with streaks of green and micaceous sandstones; represent various southern members	15 to 40	460	
10. **Sandstone, Tallery**, green, micaceous, flaggy or shaly	5 to 20	480	
11. Shales, red or green, with streaks of green and micaceous sandstones; represent various southern members	15 to 40	520	
12. **Sandstone, Avis**, green, micaceous, and flaggy or shaly	5 to 15	535	115
13. Shales, red or green, with streaks of green and micaceous sandstone; remnants of several southern members	15 to 40	575	
14. **Sandstone, Goodwyn**, green, micaceous, and flaggy or shaly	10 to 20	595	
15. **Shales, Upper and Lower Goodwyn**, red or green	5 to 15	610	
16. **Sandstone, Upper Bellepoint**, reddish- or greenish-brown, micaceous, medium-coarse, usually flaggy	15 to 30	640	105
17. Shales, red or green, with fragments of sandstone; represent several southern members	25 to 60	700	
18. **Sandstone, Stony Gap (Hinton of Stevenson)**, greenish- or reddish-brown or occasionally gray, sometimes flaggy, micaceous and shaly but often massive and coarse, making cliff; present generally throughout county	20 to 50	750	110
Bluefield Group (200′ to 650′)			
19. **Shale, Coney**, red or green; carries marine fossils in southern counties; none observed in Randolph	10 to 40	790	
20. **Sandstone, Clayton**, usually red, often flaggy and shaly but sometimes massive	5 to 25	815	
21. **Shale, Clayton**, red or green; carries marine fossils in southern counties; none observed in Randolph	15 to 35	850	
22. **Sandstone, Graham**, reddish or greenish-brown, usually flaggy, some-			

		Thickness. Feet.	Total. Feet.	Intervals. Feet.
	times carries limestone conglomerate at base; probably correlates with **Big Spruce Knob Sandstone** of Webster Report	10 to 25	875	125
23.	**Shales, Upper and Lower Graham**, red or green; carry marine fossils in southern counties; none observed in Randolph	15 to 40	915	
24.	**Sandstone, Bertha**, reddish- or greenish-brown, micaceous, flaggy	10 to 25	940	
25.	**Shales, Upper and Lower Bertha**, red or green; carry marine fossils in southern counties; none observed in Randolph	10 to 30	970	
26.	**Sandstone, Bradshaw**, usually reddish- or greenish-brown and flaggy but sometimes greenish-gray and fairly coarse	10 to 25	995	120
27.	**Shale, Bradshaw**, red or green; carries marine fossils in southern counties; none observed in Randolph	10 to 25	1020	
28.	**Sandstone, Indian Mills**, reddish- or greenish-brown, flaggy	10 to 25	1045	
29.	Shales, red or green, represent **Indian Mills Shale**, etc.	20 to 65	1110	
30.	**Sandstone, Droop**, usually greenish-brown, thick-bedded, and hard; makes prominent cliff in valley of Dry Fork of Cheat; also makes high shoulder along western slope of Cheat Mountain. This is probably the **Maxton Oil Sand**	20 to 50	1160	165
31.	**Shale, Talcott (Clore age)**, red, with occasional streaks of dark, carbonaceous limestone; carries marine fossils in southern counties; none observed in Randolph	5 to 15	1175	
32.	**Shale, Ada (Clore age)**, green, fissile, and calcareous; often contains abundant marine fossils, brachiopods (**Spirifer pellaensis**, etc.); pelecypods, gastropods, crinoids, and fish teeth	10 to 50	1225	
33.	**Limestone, Reynolds (Clore age)**, gray, shaly; contains many marine fossils, brachiopods (abundant **Orthotetes**, **Composita**, **Spirifer pellaensis**, etc.), crinoids, etc. (see **Lot 378**). This appears to be the **Little Lime** of the West Virginia oil fields	5 to 25	1250	90
34.	**Shale, Bickett**, red or sandy	5 to 25	1275	
35.	**Sandstone, Webster Springs**, (Pales-			

	Thickness. Feet.	Total. Feet.	Intervals. Feet.
tine age), greenish-gray or greenish-brown, thick-bedded, micaceous, hard; makes Whitaker Falls on Elk River; prominent eastward along waters of Elk; makes shoulder along western slope of Cheat Mountain; makes ledge in valley of Dry Fork of Cheat -----	20 to 50	1325	75
36. **Limestone, Glenray, (Menard age),** usually dark-gray and shaly or sandy, but becoming pinkish-gray, hard, and pure in upper valley of Dry Fork of Cheat; contains abundant marine fossils, brachiopods, crinoids, cup corals, blastoids (**Archimedes**) --------------	0 to 25	1350	
37. **Shale, Lillydale, (Menard age),** sometimes red but usually dark-green, fissile, and calcareous with occasional nodules of iron carbonate; contains numerous marine fossils, brachiopods (**Orthotetes, Spirifer pellaensis, Composita, Productus inflatus,** etc.), pelecypods (**Sulcatopinna,** etc.), crinoids, fenestelloids. Often contains in its lower part a greenish-gray or greenish-brown, flaggy, lenticular sandstone (**Edray Sandstone of Tar Springs age**). This shale is apparently the **Pencil Cave** of the oil regions of West Virginia ------	10 to 50	1400	75
Greenbrier Series ---------------------------	-- -- --	---	

SUBDIVISIONS, MAUCH CHUNK SERIES.

As indicated in the above general section the Mauch Chunk contains four major subdivisions and numerous individual members. In the somewhat expanded column of the southern part of the county the four subdivisions may be recognized without great difficulty but north of Elkins they lose much of their distinctive character and proper contacts are difficult to determine. Generallly, however, the Stony Gap Sandstone at the base of the Hinton Group makes a fairly bold ledge which aids in mapping.

TOPOGRAPHIC EXPRESSION, MAUCH CHUNK SERIES.

In the western part of the county the Mauch Chunk almost always occurs under a protective mantle of Pottsville and is buttressed at the base by Greenbrier, Pocono, and Devonian. In these localities the Mauch Chunk slopes are fairly smooth and steep except that they are littered by Pottsville boulders and are occasionally broken by ledges sufficiently durable to make cliffs. In the southeastern corner of the county, however, the Pottsville is almost entirely absent in Rich Mountain west of Dry Fork and is entirely eroded from the summits of Little Middle Mountain and hence in these two high ranges the uninfluenced topographic forms of the Mauch Chunk may be observed to good advantage. These summits are almost always smoothly rounded and then descend rather steeply, but smoothly, to the lower part of the series where they are interrupted by the twin cliffs of the Droop and Webster Springs Sandstones. At the base the profile flattens out and merges into the Greenbrier-Pocono shelf.

AREAL EXTENT, MAUCH CHUNK SERIES.

Figure 8 shows at a glance the outcrops of Mauch Chunk and on Map II its areal extent may be studied in more detail. West of the Rich Mountain range which lies west of Tygart Valley, and north of Point Mountain, it is above drainage in the gap of Tygart River near Aggregates, on Middle Fork River below Cassity, on Left Fork of Buckhannon River near Star, and along a portion of Back Fork of Elk and some of its tributaries. South of Point Mountain its entire column is exposed along both sides of Elk River and in the environs of Elk Mountain and Mingo Knob. Its upper portion is also exposed at Three Forks of Gauley River.

In the Leading Creek Valley its attenuated northern phase outcrops along the eastern slope of Laurel Ridge. In Tygart Valley its full column is visible on the eastern slope of Rich Mountain and the western slope of Cheat Mountain, and these exposures join together at the head of the river. On Shavers Fork of Cheat it is all visible along the western slope of McGowan Mountain and on both sides of the river in the vicinity of Bowden, but above this point its lower portion goes beneath drainage and thereafter, to the head of the river, there is only a partial exposure. Farther east there is complete exposure on the eastern slopes of Shavers Mountain and Back Allegheny Mountain and on the western slope of Rich Mountain which lies west of Dry Fork. South of Gregg Knob of Rich Mountain and on Little Middle Mountain it is not covered by Pottsville and hence forms a large part of the topography, its upper part being eroded.

Along Dry Fork it is visible in Rich Mountain to the west, in the valley of Red Creek around Laneville, and on the western slope of Allegheny Mountain southward to Whitmer. In all its exposures it may not be studied with satisfaction at any one point, as it is often covered with Pottsville debris or

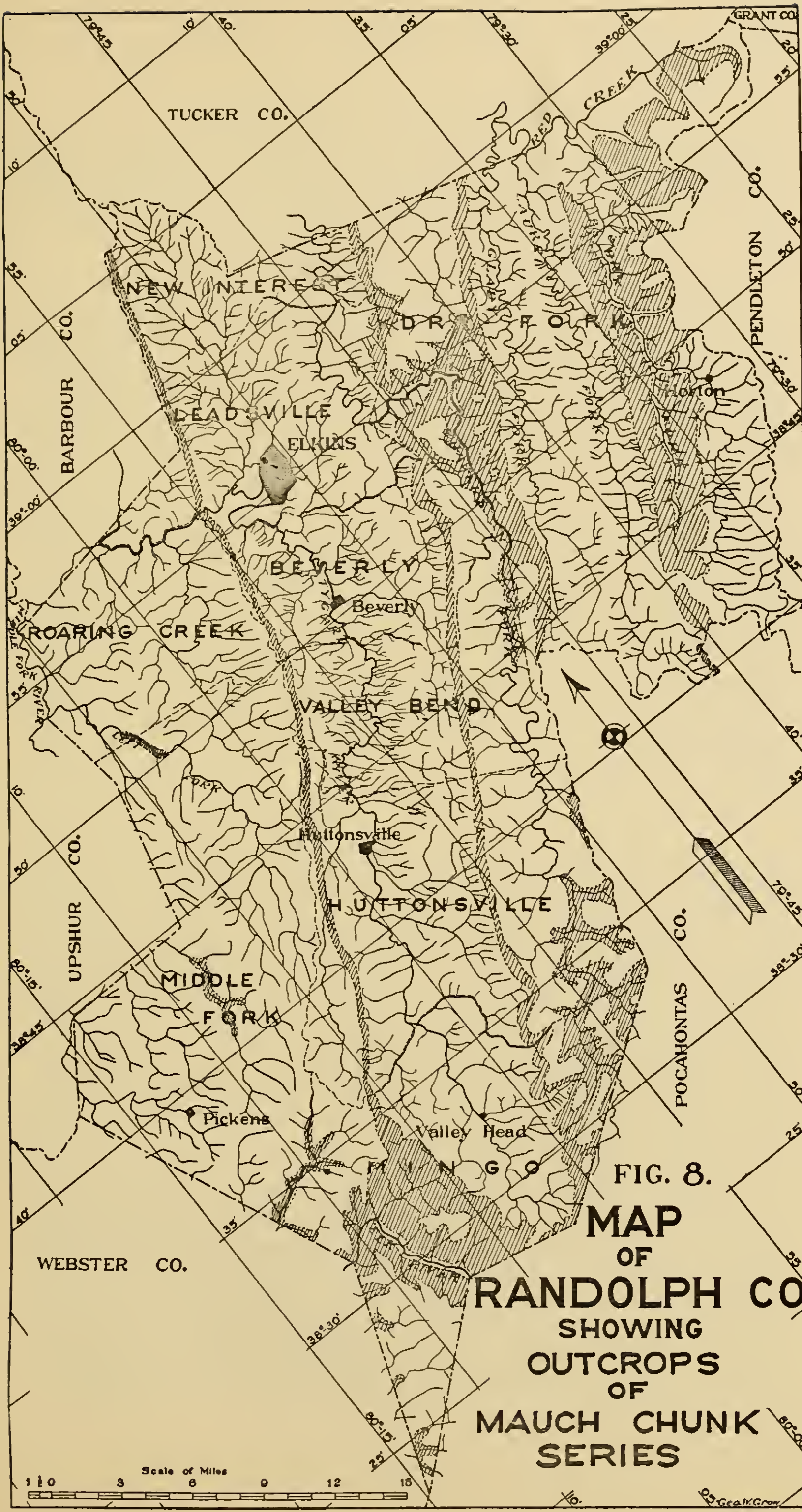

FIG. 8.

MAP OF RANDOLPH CO. SHOWING OUTCROPS OF MAUCH CHUNK SERIES weathered into soil to such an extent that the bedded rocks are not visible. Many of its members can be recognized from place to place, and its full stratigraphic aspect can therefore be presented in fair detail.

CONTACTS, MAUCH CHUNK SERIES.

The upper contact of the Mauch Chunk with the overlying Pottsville, where there is a considerable unconformity, has already been discussed in the description of the latter series, page 237. At its base it rests upon the Greenbrier Series of the Mississippian where the transition is less abrupt and where the boundary has been more or less arbitrarily fixed. This boundary is not difficult to recognize, however, as the Greenbrier is usually terminated by the heavy beds of the Alderson Limestone which seldom need be mistaken, followed above by the soft and only slightly calcareous strata of the Lillydale Shale of the Mauch Chunk. Above the Lillydale the lower part of the Mauch Chunk consists of an alternation of limestone, shale, and sandstone but these beds differ materially from the Greenbrier. From the Greenbrier into the Mauch Chunk there is a gradual change in faunal characteristics. This change is of stratigraphic value but the differences in lithology are more readily perceptible and can safely be used in field mapping.

FOSSIL LIFE, MAUCH CHUNK SERIES.

Plant life in the Mauch Chunk, although scanty, is not altogether absent. In several of the sandstones there are preserved impressions of stems and in the pale-green shales which may sometimes be found at the base of the sandstones there are occasional ferns which are of much interest. Plants in a poor state of preservation may also be found in the carbonaceous shales attending the thin and irregular coals. **Fossil Lots 422, 442, 444, 452, 453, and 454** were collected from the Mauch Chunk in Randolph and adjacent counties, partly with the aid of Dr. David White. Such determinations of these plants as have been made by Dr. White will be found in the descriptions of the proper stratigraphic horizons and will also be summarized in Chapter XIV.

Marine fossils in the Mauch Chunk are very scanty in the region north of Elkins but farther south and east they are abundant in the lower part of the series and they also range upward nearly to the top but become much less numerous. Practically all calcareous members contain them and usually they may also be found in the dark-green shales. **Fossil Lots 309, 391, 442, 448, and 455** were collected from the Mauch Chunk in Randolph or adjacent counties. Most of these collections were submitted to Dr. John L. Tilton whose identifications appear in the descriptions of the proper horizons and also in his paleontological summary in Chapter XV.

CORRELATION, MAUCH CHUNK SERIES.

The Mauch Chunk Series with its four subdivisions—Bluestone, Princeton, Hinton, and Bluefield—as exhibited in the general section at the beginning of this Chapter, largely represents the Mauch Chunk of Pennsylvania (No. XI of the earlier Rogers' classification), except that in the latter State certain calcareous beds which are now known to belong to the Greenbrier of West Virginia were included. The Greenbrier beds so included in Pennsylvania embrace the attenuated remnants of the Union Limestone, including the Gasper, Bethel, and Fredonia portions which were together known as the Trough Creek Limestone in the Broad Top Basin. In West Virginia these beds thicken rapidly to the southward and other typical Greenbrier material is added on them and beneath them so that their separate description as Greenbrier is fully justified.

To the southwestward the Mauch Chunk correlates in part with the Pennington Shale of Virginia but apparently the Pennington included nothing below the base of the Stony Gap Sandstone and hence did not include the important Bluefield Group which forms the lower half of the Mauch Chunk in West Virginia.

In western Kentucky and the Mississippi Valley a very considerable part of the upper Mauch Chunk, including all of the Bluestone, Princeton, Hinton, and part of the Bluefield Group, is absent by unconformity but the lower portion remains, being recognizable as part of the classic Chester Series. The Chester, however, includes a considerable part of the Greenbrier and hence is correlative only in part with the Mauch Chunk.

In the extreme South the Parkwood Formation of the Mississippian is described by Butts[1] as largely bridging the gap that exists elsewhere between the Mississippian and Pennsylvanian, and he cites the occurrence of both Mississippian and Pennsylvanian fossils in support of his conclusion. To the writer it would appear that the Bluestone, Princeton, and possibly part of the Hinton may be in part correlative with the Parkwood, although no critical study of the situation has been made. The Bluestone of southern West Virginia contains only a few megascopic fossils with which to make comparisons but it has many minute ostracods and other microscopic

[1]Chas. Butts, Geology of Alabama, Alabama Geol. Survey, pp. 204-208; 1926.

forms and the same statement is true of the upper part of the Pennington in Virginia. A careful examination of these faunas in West Virginia and Virginia, and a search for similar faunas in Alabama would be of great scientific interest.

DESCRIPTION OF MEMBERS, BLUESTONE GROUP OF MAUCH CHUNK SERIES.

The Bluestone Group of the Mauch Chunk is most fully expanded in Mercer County where it has been subdivided by Reger[2] and its individual members have been described. In Randolph County it becomes so thin and shaly that the lithology of its members is indistinct and no attempt has been made to introduce them into the general section at the beginning of this Chapter. In certain measured sections, however, the Bluestone has been studied and its outstanding strata have been speculatively named.

In **Middle Fork District** the Lost Run of Middle Fork Section, as published in Chapter V, exhibits only part of the Bluestone, including 25 feet of red and variegated shale without sandstone. The Cassity Section gives its full thickness as 61′ 6″, mostly green shale with some green sandstone. The Laurel Branch of Middle Fork Section also gives the full thickness, 48′ 2″, described in a boring as fire clay and green shale with some green sandstone. The presence of true fire clay at this horizon, however, is improbable, either in the basal Pottsville or the upper Mauch Chunk. In the Hartridge Section it is only 16 feet thick, being composed of red and dark shales. At Arvondale Junction the entire Mauch Chunk was pierced by a well but the base of the Bluestone is not evident.

In **Leadsville District** the Bluestone is only 23 feet thick at the Aggregates Section, being composed of red shale. The Laurel Ridge Section includes its horizon but the strata were entirely concealed. In **Beverly District** the Beverly Section includes the entire Mauch Chunk but the lower contact of the Bluestone is unrecognizable. At the Bemis Section no Bluestone appears to be present. In **Huttonsville District** the Cromer Top, Cheat Bridge, and Durbin Sections include all or part of the Bluestone but its proper basal contact was not evident. In **Mingo District** the Bluestone is represented by only five feet of red shale at the Valley Head Section. In the Snyder Knob and Hopkins Sections it is undivided, but at

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[2]David B. Reger, Mercer-Monroe-Summers Rept., W. Va. Geol. Survey, pp. 293-301 and 314-325; 1926.

Mingo it is 170 feet thick and mostly red shale. At Webster Springs it is 78 feet thick, being mostly red and green shale with seven feet of included massive sandstone which may be the Glady Fork Sandstone of Mercer County. At Elk Mountain it is 150 feet thick but entirely concealed. At Slaty Fork it is 100 feet, mostly red shale but partly concealed. At Three Forks of Gauley it is only 35 feet thick and composed of red shale.

In Dry Fork District the Bluestone Group undergoes an important change, being often composed largely of green shale instead of red. This circumstance has led to considerable confusion among coal prospectors owing to the common custom of starting at the base of the first conglomerate above the uppermost red shales and measuring upward to find the Sewell Coal. In some cases the Princeton Conglomerate of the Mauch Chunk has been mistaken for the conglomeratic Upper Raleigh of the Pottsville with consequent failure to find the coal. In this region a careful distinction between the green and fissile shale of the Mauch Chunk and the sandy and carbonaceous shale of the lower part of the Pottsville is highly important. In the Bickle Knob Section the Bluestone is undivided but in the Bowden Section it is 130 feet thick and composed of red and green shale. Here the green shale contains marine fossils and Fossil Lot 391 was collected on the southern slope of Middle Ridge. According to Dr. Tilton the collection contained an unidentified species of Fenestella. In the Collett Gap Section the group is 285 feet thick and composed of red and green shale, partly concealed. At Otter Creek it is only 35 feet thick, being red shale. At Laneville it is undivided but at Little Stonecoal Run of Red Creek it is 145 feet thick, being partly red and green shale and also having 15 feet of massive, green sandstone which is probably the Glady Fork. At Stonecoal Run of Red Creek it is 190 feet thick, being partly red and green shale but having two sandstones with a thickness of 30 feet each. From their relative positions the upper may represent the Bent Sandstone of Mercer County and the lower the Glady Fork. At the Red Creek Section the Bluestone has decreased to 10 feet, being mostly green shale. At the Hazelwood and Job Knob Sections it is undivided but at the Haines Knob Section it is 325 feet thick, and mostly composed of red shale. At Spruce Knob, Pendleton County, it is 20 feet thick, and composed of red and green shale in which there are plant stems from which Fossil Lot 442 was collected. According to Dr. David White the lot contained Bornia radiata, besides a megaspore and an unidentified worm trail.

DESCRIPTION OF MEMBERS. PRINCETON CONGLOMERATE OF MAUCH CHUNK SERIES.

The **Princeton Sandstone,** or **Princeton Conglomerate** of Campbell[3], is the single member of the Princeton Group. At its type locality in Princeton, Mercer County, this formation is a brown, massive, conglomeratic sandstone, 25 feet thick. Northeastward across the State as far as Randolph and Tucker Counties it preserves its identity to a remarkable degree, becoming at some localities a much more imposing ledge than at Princeton. In Randolph it is not prominent in the northern part of the county but in the southern and eastern parts it is usually a conspicuous ledge, greenish-gray in color, massive, very hard, and conglomeratic with large white quartz pebbles which are only partly rounded, and with inclusions of limestone and shale pebbles near the base. Its thickness varies as a rule from 15 to 50 feet but at some localities this is greatly increased.

In **Middle Fork District** the Princeton is 43′ 1″ thick at the Cassity Section of Chapter V, being a gray sandstone. At the Laurel Branch of Middle Fork Section it is 59′ 1″ thick, gray, and conglomeratic. At the Hartridge Section it is represented by 20 feet of sandstone. In **Leadsville District** the Aggregates Section notes it as greenish-brown, 28 feet thick, but partly concealed. In **Beverly District** the Bemis Section shows it to be 50 feet thick, massive, and pebbly, but partly concealed. In **Valley Bend District** it was recognized in an old road ascending the eastern side of Rich Mountain 2.2 miles northwest of Valley Bend, being green and fine-grained, partly massive and partly flaggy, its top having an elevation of 3085′ B. On Shavers Fork of Cheat it makes a waterfall at the mouth of Red Run above Cheat Junction, there being 15 feet visible with its top at elevation 2920′ B. At Red Roaring Run of the same river its top is visible at elevation 2800′ B., about 50 feet above the level of the river.

In **Mingo District** it is noted in the Valley Head Section as 15 feet thick, green, massive, and coarse; and in the Mingo Section as 80 feet thick, greenish-gray, massive, and coarse. At the Webster Springs Section it is 28 feet thick, fine-grained, and thick-bedded or flaggy, but along the State road ascending Point Mountain 2.5 miles east of the Springs it is very well exposed at elevation 2185′ B., being massive, greenish-gray, coarse, and 30 feet thick, with shaly conglomerate at the base and with numerous plant stems. **Fossil Lot 453** was collected at this locality and forwarded to Dr. David White at Washington. Many of these stems resemble

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[3] M. R. Campbell, Pocahontas Folio, No. 26, U. S. Geol. Survey; 1896.

Calamites and may therefore be **Bornia radiata**, but no report has been received from Dr. White.

In the Elk Mountain Section the Princeton is 25 feet thick, and a greenish-gray sandstone. In the Three Forks of Gauley Section it is noted as 145 feet thick, massive, and conglomeratic, without its base being exposed. No similar thickness of the Princeton was elsewhere found. On the eastern rim of Back Allegheny Mountain just east of the summit of Bald Knob, within the edge of Pocahontas County, the Princeton is visible at elevation 4675' B., with a thickness of 10 feet and with many quartz pebbles which are slightly flattened and slightly elongated, the longest observed diameter being 1½ inches.

In **Dry Fork District** the Princeton is recorded in the Bowden Section, being gray, hard, massive, and conglomeratic, with a thickness of 25 feet. In the Collett Gap Section it is 40 feet thick, and greenish-brown, making a cliff. In the Otter Creek Section it is 15 feet thick and massive. In the Little Stonecoal Run of Red Creek Section it is a huge ledge, 85 feet thick and containing many angular white quartz pebbles some of which are one inch to two inches in diameter. In the Stonecoal Run of Red Creek Section it is 15 feet thick, massive, and pebbly; and in the Red Creek Section it is massive, pebbly, and 45 feet thick. In the Haines Knob Section it is 25 feet thick, greenish-gray, and massive. In the Whitmer Section it is greenish-brown, massive, and conglomeratic at the base, capping a spur of Allegheny Mountain east of Gandy. In the Spruce Knob Section, Pendleton County, it is 45 feet thick, greenish-gray, and massive, containing some black iron crystals and shaly conglomerate, and having plant stems. **Fossil Lot 444** was collected from these stems and submitted to Dr. David White who identified **Bornia radiata (Asterocalamites scrobiculatus)**.

So far as known the Princeton has not been quarried in the county and in general its conglomeratic character would doubtless make it objectionable as a building stone. In some localities, however, it is more homogeneous and could probably be used for masonry structures.

DESCRIPTION OF MEMBERS, HINTON GROUP OF MAUCH CHUNK SERIES.

Terry Shale and Limestone.

The **Terry Shale** of Reger[4] and the **Terry Limestone** of Krebs[5] together form the highest stratum of the Hinton Group

[4]David B. Reger, Mercer-Monroe-Summers Rept., W. Va. Geol. Survey, pp. 330-331; 1926.

[5]C. E. Krebs, Raleigh Rept., W. Va. Geol. Survey, p. 69; 1916.

in Randolph County. In the expanded section of southern West Virginia these two beds are distinct, the shale being just beneath the Princeton Sandstone and the limestone just beneath the shale. In Randolph, however, the two members can scarcely be separated. When fully exposed there is usually a bed of greenish-gray, sandy shale, 15 to 30 feet thick, containing streaks of ferruginous limestone. At some localities there are abundant marine fossils, partly in the shale but generally in the more calcareous zones, including crinoids, brachiopods, pelecypods, and fish remains.

In **Beverly District** this combination of shale and limestone, as recorded in the Bemis Section, page 161, is well exposed along the old Bemis Railroad grade (now a county road) on the west side of Shavers Fork of Cheat 0.6 mile north of Bemis at elevation 2720' B. Here it is green and sandy shale with calcareous lenses and with rather abundant marine fossils. **Fossil Lot 379**, collected by the writer, revealed to Dr. Tilton crinoid stems, **Orthotetes kaskaskiensis**, and **Cliothyridina sublamellosa?**, as more fully discussed by him in Chapter XV. Fossils at this spot are abundant although the number of species is small. Another interesting exposure is as follows:

Local Measurement at Fossil Lot 309.

Beverly District, Randolph County; in old county road on north side of Fishinghawk Creek 0.7 mile west of Bemis; measured with aneroid by David B. Reger in horizontal strata and arranged in descending stratigraphic order.

			Thickness. Feet.	Total. Feet.
Pottsville Series (30'+)				
1. Sandstone Upper Raleigh (Sharon), mostly concealed at this locality but well exposed about 500 feet farther west where it is massive and carries quartz pebbles			30	30
Mauch Chunk Series—Bluestone Group (30')				
2. Shale, partly red and partly concealed			30	60
Mauch Chunk Series—Princeton Conglomerate (15')				
3. Sandstone, Princeton, greenish and shaly			15	75
Mauch Chunk Series—Hinton Group (20'+)				
4. Shale, red	5' 0"	Terry Shale and Limestone (Fossil Lot 309)	20	95
5. Shale, dark, nodular, with marine fossils, to creek (2685' B.)	15 0			

The above fossil collection, made in 1924, was forwarded to Dr. Geo. H. Girty of the U. S. Geological Survey at Washington, who evidently has not had time to examine it. The notes of the writer, however, record the presence of gastropods and brachiopods (**Productus and Lingula**).

In **Huttonsville District** what the writer assumes to be the Terry horizon is exposed in the cut of the Western Maryland Railway on the east side of Shavers Fork just south of Lambert Run and 1.6 miles south of Cheat Bridge at elevation 3581′ B. Here the superjacent and subjacent formations are not visible but the cut exhibits 15 feet of red and green shale with many ferruginous and phosphatic nodules. **Fossil Lot 448** was collected in which Dr. Tilton recognized **Aviculopecten** sp., pelecypods, fish bones, and ganoid fish scales (**Palaeoniscus** sp., **Eurylepis**?). His interesting comment on this collection will be found in Chapter XV. Some of the phosphatic nodules (**Sample No. 756R**) were submitted to Mr. Kaplan for chemical analysis and showed 9.95 per cent. of P_2O_5, equaling 21.73 per cent. of calcium phosphate ($Ca_3P_2O_8$). In a State which has no visible supply of phosphate such a result would be interesting if there were an abundance of the material. This, unfortunately, does not appear to be the case.

Pluto Shale.

The **Pluto Shale** of Reger[6], coming between the Terry horizon and the Pluto Coal, was not observed in the county, its horizon being concealed along the eastern end of Point Mountain where it should be visible over an exposure of the Pluto Coal along the State road. At its type locality on Left Fork of Leatherwood Creek, 3.5 miles southeast of Bergoo town, Webster County, it is a black, fissile shale and contains **Lingula**. At other neighboring localities it contains plant fossils. Unfortunately no collection of these plants was made.

Pluto Coal.

The **Pluto Coal** of Krebs[7], coming just beneath the Pluto Shale and only a comparatively few feet below the Princeton Sandstone, was observed in a few localities in **Mingo District**, being lenticular, shaly, and impure and without economic importance. In the Valley Head Section, page 171, it is noted as a mere streak of coal along the State road at the eastern end of Point Mountain. In the Elk Mountain Section, page 184, it is recorded as a streak at an exposure on the northwestern slope of the mountain at elevation 3660′ B. In **Dry Fork District** its horizon is recognizable on the western slope

[6]David B. Reger, Webster Rept., W. Va. Geol. Survey, pp. 219-20; 1920.

[7]C. E. Krebs, Raleigh Rept., W. Va. Geol. Survey, pp. 74 and 635; 1916.

of Shavers Mountain facing Shavers Fork one mile south of Montes where some black, coaly shale was uncovered at elevation 3045′ B. just below the Princeton Sandstone along a plane being prepared to haul coal down the mountain from the Thompson property.

Pluto Limestone.

The **Pluto Limestone** of Reger[8], belonging next beneath the Pluto Coal, is a lenticular, sandy, and impure formation in Randolph, usually less than five feet thick, varying in color from gray to red or dark and carrying a few marine fossils. In **Valley Bend District** it is noted in the Cheat Junction Section, being only one foot thick, dark, shaly, and carrying marine fossil fragments. In **Mingo District** it is visible along the State road at the eastern end of Point Mountain as exhibited in the Valley Head Section, being 23 feet thick but mostly red shale with limestone boulders except for one foot of hard, siliceous lime at the base.

Lower Pluto Shale.

The **Lower Pluto Shale** of Reger[9], belonging between the Pluto Limestone and Falls Mills Sandstone, and containing marine fossils in some of the southern counties, was not observed in Randolph. Presumably it should be found in some of the thick Mauch Chunk stratigraphy of Mingo District.

Falls Mills Sandstone.

The **Falls Mills Sandstone** of Reger[10], belonging next beneath the Lower Pluto Shale and being the first sandy ledge of consequence below the Princeton Sandstone, was recognized at various points in Randolph, where it is usually green and micaceous and flaggy or shaly, with a thickness of 15 feet or less. In **Beverly District** it is recorded as five feet and massive in the Bemis Section. In **Huttonsville District** the Cromer Top Section records it as 15 feet thick, and green. In **Mingo District** the Valley Head Section shows it only two feet thick, and shaly. In **Dry Fork District** it is five feet thick, and green, in the Little Stonecoal Run of Red Creek Section; in the Haines Knob Section it is 30 feet thick, reddish-brown, and flaggy; and in the Whitmer Section it is green, thin-bedded, but hard, making a 40-foot cliff.

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[8]David B. Reger, Mercer-Monroe-Summers Rept., W. Va. Geol. Survey, p. 334; 1926.

[9]Ibid., p. 335.

[10]Ibid., pp. 335-6.

Tallery Sandstone.

The **Tallery Sandstone** of Reger[11] appears to be the next recognizable member below the Falls Mills Sandstone in Randolph County, the interval between these ledges being 15 to 40 feet and mostly composed of red and green shales with streaks of sandstone. In the southern counties this nondescript interval is filled by the **Falls Mills Shale, Falls Mills Limestone, Upper Fivemile Shale, Fivemile Coal,** and **Lower Fivemile Shale,** but all these are unrecognizable in Randolph. The Tallery Sandstone is green, micaceous, flaggy or shaly, and varies in thickness from five to 15 feet. In **Beverly District** it is recorded in the Bemis Section as five feet, green, and massive. In **Mingo District** the Valley Head Section notes it as 15 feet, green, and shaly.

Avis Sandstone.

The **Avis Sandstone** of Reger[12], separated from the Tallery by 15 to 40 feet of red and green shales with streaks of micaceous sandstone, is the next recognizable formation in Randolph, being green, micaceous, flaggy or shaly, and five to 15 feet thick. In more southern counties the brief shale interval separating these two sandstones is occupied by the **Tallery Limestone, Upper Tallery Shale, Tallery Coal, Lower Tallery Shale, Low Gap Sandstone, Low Gap Limestone,** and **Low Gap Shale.** The Avis Sandstone itself is somewhat uncertain but in the Valley Head Section of **Mingo District** it is recorded as five feet thick, green, and shaly.

Goodwyn Sandstone.

The **Goodwyn Sandstone** of Reger[13] comes next in recognizable succession below the Avis in Randolph County, being green, micaceous, flaggy or shaly, and 10 to 20 feet thick. In southern West Virginia the shale interval between these two sandstones is occupied by the **Upper Avis Shale, Avis Limestone, Lower Avis Shale, Payne Branch Sandstone, Payne Branch Shale, Hackett Sandstone, Hackett Shale, Tophet Limestone, Upper Tophet Shale, Tophet Sandstone, Tophet Coal, and Lower Tophet Shale.** Of these missing members the Avis Limestone is probably the most important but apparently no trace of it exists in Randolph County and it is not reported in Pocahontas. In **Beverly District** the Goodwyn Sandstone was noted in the Bemis Section, outcropping at the road fork on Fishinghawk Creek just west

[11]Ibid., pp. 340-1.
[12]Ibid., pp. 345-6.
[13]Ibid., pp. 358-9.

of Bemis and being green, massive, and 30 feet thick. In **Mingo District** it is recorded in the Valley Head Section as five feet thick, green, and shaly.

Upper and Lower Goodwyn Shales.

The **Upper and Lower Goodwyn Shales** of Reger[14], which in the southern counties occupy most of the interval between the Goodwyn Sandstone and Upper Bellepoint Sandstone, being at some points separated into distinct beds by the **Goodwyn Coal**, have an apparent thickness of five to 15 feet in Randolph without trace of intervening coal. These shales are red or green and may or may not contain marine fossils as they were given no special examination.

Upper Bellepoint Sandstone.

The **Upper Bellepoint Sandstone** of Reger[15], coming next below the Goodwyn Shales, is a fairly constant member of the Hinton Group in southern Randolph County. At its type region in Summers County this ledge is nearly always red but in Randolph it is reddish- or greenish-brown, micaceous, medium-coarse, and usually flaggy, with a thickness of 15 to 30 feet. In **Beverly District** it is recorded in the Bemis Section, being 20 feet thick and massive, as exposed slightly above drainage in the bluff east of Shavers Fork just opposite Bemis. In **Huttonsville District** it is visible along the Staunton and Parkersburg Pike at elevation 3475′ B., making a cliff, reddish-brown in color, cross-bedded at the top but green and massive at the base, as recorded in the Cromer Top Section of Chapter V. In **Mingo District** the Snyder Knob Section exhibits it at elevation 4100′ B., making a greenish-brown, flaggy cliff on the eastern slope of Cheat Mountain. In **Dry Fork District** the Bickle Knob Section shows it to be 20 feet thick, reddish-brown, and flaggy.

Beneath this sandstone in southern Randolph there is an interval of 25 to 60 feet of red or green shales with fragmentary sandstones, representing the horizons of the **Upper Bellepoint Shale, Middle Bellepoint Sandstone, Middle Bellepoint Limestone, Middle Bellepoint Shale, Lower Bellepoint Sandstone, and Lower Bellepoint Shale.** This stage may or may not contain marine fossils, no special study of it having been made.

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[14]Ibid., pp. 359-60.
[15]Ibid., pp. 360-62.

Stony Gap Sandstone (Hinton of Stevenson).

The **Stony Gap Sandstone** of Reger[16], which was many years ago called the **Hinton Sandstone** by Dr. John J. Stevenson but which latter name has fallen into disuse owing to the term being more widely applied to the group in which it occurs, is the basal member of the Hinton Group and by far its most persistent ledge in Randolph County. Generally it is greenish- or reddish-brown and thick-bedded or flaggy, but often it is gray, massive, and coarse with infrequent quartz pebbles and with occasional inclusions of shale or limestone conglomerate at the base. Its thickness varies from 20 to 50 feet and it may be found at most of the Mauch Chunk localities in the county.

In **Leadsville District** it is recorded in the Aggregates Section as a green, flaggy, fine-grained cliff, 22 feet thick. In **Beverly District**, as shown by the Beverly Section, it is visible along the Staunton and Parkersburg Pike, being greenish-gray, cross-bedded, medium-coarse, and 30 feet thick. In the Bemis Section 15 feet of it is exposed in the bed of Shavers Fork and in the bluff to the eastward just opposite the railroad station. Here it is grayish-white and very hard. On the northern slope of Pond Lick Mountain one mile south of Meadows Station it was noted at elevation 3225′ B., as massive, greenish-brown, and 15 feet thick. In **Huttonsville District** the Cromer Top Section shows it as greenish-red, massive, and 40 feet thick; and the Durbin Section notes it as greenish-gray, massive, coarse, and 40 feet thick.

In **Mingo District** the Valley Head Section records it as 30 feet thick, green, partly shaly and partly massive, at elevation 3300′ B. In the Snyder Knob Section it is 30 feet thick, reddish-brown, and thick-bedded, making a prominent rock castle at elevation 3975′ B. In the Mingo Section it is greenish-brown, partly massive, and 15 feet thick, at elevation 3865′ B. In the Webster Springs Section it is 42 feet thick, greenish-gray, and massive, at elevation 1850′ B., having some quartz pebbles and carrying limestone or shale conglomerate at the base. On the State road ascending Point Mountain just northeast of Ralph, Webster County, the following exposure is visible where the county road turns off toward Bergoo:

		Feet.
1.	**Sandstone, Stony Gap**, coarse, greenish-gray cliff (1985′ B.)	25
2.	**Limestone conglomerate**, at base of cliff	4
3.	**Shale, Coney**, green, with a few plant stems, to road	5

[16] Ibid., pp. 371-8.

In the Whitaker Falls Section it is a flaggy cliff, 35 feet thick, at elevation 2830' B. In the Slaty Fork Section it is 50 feet thick, brown, coarse, and making a cliff at elevation 3485' B. beneath the Nutter Flat.

In **Dry Fork District** the Bickle Knob Section records it as 25 feet thick, reddish-brown, and fairly coarse. The Collett Gap Section notes it as green, flaggy, fine-grained, and 40 feet thick. In the Job Knob Section on Dry Fork it is reddish-brown, thick-bedded, and 30 feet thick. In the Whitmer Section it is greenish-brown, thick-bedded, and 20 feet thick, making a cliff at elevation 3440' B. In the Osceola Section it is reddish-brown, flaggy, and 80 feet thick at elevation 4200' B., and there it has been the principal factor in preserving this high knob, as the ledge is covered by only 20 feet of shale and concealed material. In the Spruce Knob Section of Pendleton County it is 100 feet thick, green, massive, and forming a cliff at elevation 4325' B., as exposed in the bluff beneath the Spears Lumber Company Railroad at the southern end of the knob. This great ledge contains inclusions of coal spars.

At the **Western Maryland Railway Quarry** at the eastern portal of the Glady Tunnel through Shavers Mountain just northwest of Glady town this stone was quarried for lining the tunnel, the following exposure being now visible, partly in the quarry just north of the railroad and partly in the tunnel cut:

	Feet.
1. **Sandstone, Stony Gap**, greenish-gray, thick-bedded at the top but massive farther down, hard, medium-coarse, **Quarry rock**	30
2. **Sandstone, Stony Gap** (continued), greenish-gray, or bluish-gray, thick-bedded or cross-bedded, very hard, medium-coarse; exposed at tunnel mouth (2940' B.)	50
3. Shales, red and green, and a little sandstone, dip northwest, 20°	20

At localities where this sandstone becomes massive and free from cross-bedding it should make a good grade of building stone, as it is durable, has an agreeable architectural texture, and does not greatly change when weathered.

DESCRIPTION OF MEMBERS, BLUEFIELD GROUP OF MAUCH CHUNK SERIES.

Coney Shale.

The **Coney Shale** of Reger[17], lying just beneath the Stony Gap Sandstone, forms the upper member of the Bluefield

[17]Ibid., pp. 380-383.

Group. As observed in Randolph County it is red or green and sandy, 10 to 40 feet thick, and carries occasional plant fossils. In more southern counties it carries a sparse megascopic fauna and numerous microscopic ostracods but these were not noted in Randolph. In **Mingo District** this shale is visible in the State road ascending the eastern end of Point Mountain just west of the county road which turns northward to Pickens and 1.6 miles northwest of Monterville, being 40 feet thick and a deep-red color, as recorded in the Valley Head Section. Here **Sample No. 693R** was collected on the land of **Davis and Elkins**, the analysis of which is reported as follows by B. B. Kaplan and Harry J. Sigwart:

	Per cent.
Silica (SiO_2)	58.62
Ferric Iron (Fe_2O_3)	8.38
Alumina (Al_2O_3)	21.34
Lime (CaO)	----
Magnesia (MgO)	1.95
Loss of Ignition	7.52
Undetermined	2.19
Total	100.00

This shale has sufficient plasticity to be molded into brick or tile and the burned product would have a deep-red color owing to the large content of iron. The exposure, however, is not within easy reach of transportation.

In the Mingo Section the Coney Shale is noted as red and 55 feet thick. In the Webster Springs Section it is 35 feet thick, green, and red, and carrying a few plant fossils. The following exposure, noted along the road north of Elk River and 0.7 mile northeast of Ralph, Webster County, is of considerable scientific interest:

	Feet.
1. **Sandstone, Stony Gap,** greenish-gray, massive, with limestone conglomerate toward base (1935′ B.)	25
2. **Shale, Coney,** green, carbonaceous, with plant stems and ferns, and also a few marine fossils (pelecypods) (**Fossil Lot 454** collected from plants)	3

The plant fossils above collected were shipped to Dr. David White of the U. S. Geological Survey.

Clayton Sandstone.

The **Clayton Sandstone** of Reger[15], coming next beneath the Coney Shale, is usually red, often shaly or flaggy but sometimes massive, and varies in thickness from five to 25

[15]Ibid., pp. 383-384.

feet. It does not make a conspicuous ledge but was noted at a few points in the southern part of the county. In **Mingo District** the Mingo Section notes it as a red, flaggy cliff, 15 feet thick. In the Webster Springs Section it is red, partly massive, and 14 feet thick. In **Dry Fork District** it is recorded in the Haines Knob Section as 10 feet thick, and red.

Clayton Shale.

The **Clayton Shale** of Reger[19], coming next beneath the Clayton Sandstone, may be identified in southern Randolph from its association with the sandstone, being 15 to 35 feet thick, and red or green in color. In the southern counties it carries marine fossils but these were not observed in Randolph. In **Mingo District** it was noted in the Mingo Section as red and 30 feet thick. In the Webster Springs Section it is red but partly concealed, the apparent thickness being 70 feet.

Graham Sandstone.

The **Graham Sandstone** of Reger[20], coming next below the Clayton Shale and probably correlating with the **Big Spruce Knob Sandstone** of the same author[21], is a rather constant member of the Bluefield Group in southern Randolph, being reddish- or greenish-brown, usually flaggy and sometimes carrying limestone conglomerate at the base. In **Huttonsville District** it is a prominent ledge in the Staunton and Parkersburg Pike along the western slope of Cheat Mountain as recorded in the Cromer Top Section. Here it is green and flaggy, with a total thickness of 30 feet, including 10 feet of limestone and shale conglomerate at the base, its elevation being 3385' B.

In **Mingo District** it is red, flaggy, and 10 feet thick in the Mingo Section. In the Webster Springs Section it is greenish-red, partly massive, 42 feet thick, and carries limestone and shale conglomerate at the base. In the Whitaker Falls Section it is 25 feet thick; and in the Slaty Fork Section 30 feet. In **Dry Fork District** the Haines Knob Section records it as red, shaly, and 10 feet thick. As a building stone it does not offer much promise.

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[19]Ibid., pp. 384-5.

[20]Ibid., pp. 385-6.

[21]David B. Reger, Webster Rept., W. Va. Geol. Survey, pp. 221-3; 1929.

Upper and Lower Graham Shales.

The **Upper and Lower Graham Shales** of Reger[22] apparently fill the interval between the Graham Sandstone and Bertha Sandstone in Randolph County, there being no observed occurrences of the **Graham Limestone** and **Graham (Big Spruce Knob) Coal** which in more southern counties separate the shales into two distinct members. These shales vary from 15 to 40 feet in thickness, being red or green and variegated in color and being without plant or marine fossils in Randolph so far as observed, although marine fossils occur in the Upper Graham Shale and Graham Limestone and plant fossils are preserved in the roof of the Graham Coal in counties to the southwest. In **Huttonsville District** these shales may be observed in the Cromer Top Section of Chapter V, where they are green and red, with a combined thickness of 50 feet.

Bertha Sandstone.

The **Bertha Sandstone** of Reger[23] is the next succeeding sandstone ledge of consequence below the Graham in Randolph County. Generally it is reddish- or greenish-brown, micaceous, and flaggy, with a thickness of 10 to 25 feet, its exposures being mostly confined to the thicker stratigraphic section of the southern part of the county. In **Huttonsville District** it is noted in the Cromer Top Section as red, cross-bedded, and 20 feet thick; and in the Durbin Section it is five feet thick, green, and shaly. In **Mingo District** it was not observed but in the Webster Springs Section it is recorded as seven feet thick, red, and blocky. In **Dry Fork District** the Bickle Knob Section shows it to be five feet thick, green, and flaggy; and in the Haines Knob Section it is red, shaly, and 25 feet thick. As a building stone it would not be of much interest.

Upper and Lower Bertha Shales.

The **Upper and Lower Bertha Shales** of Reger[24], together with the **Bertha Limestone** which occurs between them, fill the gap between the Bertha Sandstone and Bradshaw Sandstone in more southwestern counties. In Randolph no trace of the separating limestone was found but the shales are present, being red or green and variegated and having a thickness of 10 to 30 feet. Marine fossils were not observed.

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[22]David B. Reger, Mercer-Monroe-Summers Rept., W. Va. Geol. Survey, pp. 387-391; 1926.

[23]Ibid., pp. 391-2.

[24]Ibid., pp. 392-4.

Bradshaw Sandstone.

The **Bradshaw Sandstone** of Reger[25] comes below the Upper and Lower Bertha Shales in Randolph County, being usually reddish- or greenish-brown and flaggy but sometimes greenish-gray and fairly coarse, and having a thickness of 10 to 25 feet. Its visible exposures are largely confined to the southern part of the county. In **Mingo District** the Valley Head Section records it as red, shaly, and 15 feet thick. The Mingo Section gives it as red, flaggy, and 15 feet thick. The Webster Springs Section notes it as seven feet thick, greenish-gray, and hard. In **Dry Fork District** it is 35 feet thick, but shaly, in the Bickle Knob Section. In the Haines Knob Section it is greenish-gray, flaggy, 45 feet thick, and makes a cliff along the Elkins-Franklin road west of Job, as illustrated in Plate XXV. In general it appears to be too shaly for much use as a building stone.

Bradshaw Shale.

The **Bradshaw Shale** of Reger[26] next follows below the Bradshaw Sandstone in Randolph County, although the two are separated by the **Bradshaw Limestone** in more southern counties. The shale is red or green and variegated, with a thickness of 10 to 25 feet, and apparently carries no marine fossils although it has them in the southern part of the State.

Indian Mills Sandstone.

The **Indian Mills Sandstone** of Reger[27], coming below the Bradshaw Shale, may be observed in the southern part of the county, although it is not prominent. When found it is reddish- or greenish-brown and flaggy, with a thickness of 10 to 25 feet. In **Mingo District** it was noted in the Snyder Knob Section where it is reddish-brown, flaggy, and 15 feet thick.

Indian Mills Shale.

The **Indian Mills Shale** of Reger[28] apparently fills the gap between the Indian Mills Sandstone and Droop Sandstone in Randolph County, being red or green and 20 to 65 feet thick. In the southern counties this same interval is occupied in descending order by the **Indian Mills Shale, Raines Corner Limestone, Raines Corner Shale, Raines Corner Coal,** and **Possumtrot Shale,** containing a varied and important as-

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[25] Ibid., pp. 394-7.
[26] Ibid., pp. 398-400.
[27] Ibid., pp. 400-401.
[28] Ibid., pp. 401-404.

sortment of marine and plant fossils. The four members last named appear to have entirely vanished in Randolph, leaving only a shale with the characteristics of the Indian Mills, and hence its identification as such.

In **Beverly District** this shale is well exposed in a deep cut of the Western Maryland Railway on the west side of Shavers Fork 0.3 mile south of Flint, where it is red, argillaceous, free from sandstone lenses, and 50 feet thick, at elevation 2410′ B. A chemical sample **(No. 696R)** was collected on the land of the **Davis Coal Land Company**, on which the following analysis is reported by Kaplan and Sigwart:

	Per cent.
Silica (SiO_2)	57.97
Ferric Iron (Fe_2O_3)	7.90
Alumina (Al_2O_3)	24.07
Magnesia (MgO)	2.50
Loss on Ignition	7.34
Undetermined	0.22
Total	100.00

Such a shale as this would make building brick, building tile, or drainage tile and would burn to a deep-red color, but would not be refractory. The locality is on transportation but the steep topography is unfavorable to open-pit excavation.

Droop Sandstone.

The **Droop Sandstone** of Reger[29], lying next below the shale above described in Randolph County, is an important and conspicuous member of the Bluefield Group. In Randolph it is usually greenish-brown, thick-bedded, hard, and 20 to 50 feet thick but in some localities it changes to a white, massive ledge, more in keeping with that of its type locality on Droop Mountain, Pocahontas County. The writer has frequently expressed the opinion that this ledge probably represents the **Maxton Oil Sand** of more western counties.

In **Middle Fork District** this bed is not exposed but was noted in the Arvondale Junction Section as reported in a boring, being 44 feet thick. In **Leadsville District** it is recorded in the Aggregates Section as 15 feet thick, green, and fine-grained. In **Beverly District** the Beverly Section shows it as 25 feet thick, reddish-brown at the top but green at the base, outcropping along the Staunton and Parkersburg Pike. In the Elkhorn School Section it is 20 feet thick, green, and flaggy, with a basal elevation of 3020′ B., and making a shoulder in the sod lands along the western slope of Cheat Mountain. In the same region, on the western slope of Cheat

[29]Ibid., pp. 415-418.

Mountain facing Right Fork of Files Creek 1.5 miles northeast of Elkhorn School, it makes a great greenish-gray cliff, 60 feet thick, just under the upper end of a sharp Z-turn of the mountain road, the top of the ledge being 2990′ B. On the east side of Mike Run of Shavers Fork 0.9 mile south of Faulkner it is visible in the slope of Pond Lick Mountain, being flaggy and 30 feet thick, at elevation 2875′ B. On the west side of Shavers Fork just northwest of Woodrow it makes a prominent cliff at elevation 2465′ B.; and it apparently goes beneath Shavers Fork slightly south of Flint, 15 feet of it being visible at this point with its top at 2415′ B.

In **Huttonsville District** the Droop is recorded in the Cromer Top Section, but is not conspicuous, being only 20 feet thick and red in color. In **Mingo District** the Valley Head Section notes it as 15 feet thick, greenish-gray, but weathering out white and soft, at elevation 3150′ B., along the Point Mountain road west of Monterville. In the same region it is much better exposed in a mountain bluff 1.5 miles northwest of Monterville just east of the road which goes from Point Mountain to Elkwater Fork, where it is a white, massive, coarse, soft cliff rock at elevation 3110′ B. Here a chemical sample **(No. 671R)** was collected on the land of **Webster Stalnaker** which is reported as follows by Kaplan and Sigwart:

	Per cent.
Silica (SiO_2)	95.08
Ferric Iron (Fe_2O_3)	3.78
Alumina (Al_2O_3)	0.88
Magnesia (MgO)	0.03
Loss on Ignition	0.00
Undetermined	0.23
Total	100.00

The analysis shows the rock as containing too much iron for successful use as a glass-sand but if some cheap and easy means could be found to remove this iron the sand would otherwise be good, as it is homogeneous and contains no pebbles. By natural weathering the stone becomes clean white sand.

Along the newly graded State road north of Elk River and 1.6 miles southeast of Webster Springs the following interesting succession is found:

		Feet.
1.	Sandstone, Droop, in thick beds, laminated gray and green color, with numerous beds of shale; visible in old road (1545′ B.)	30
2.	Shale, Ada?, green, sandy	10
3.	Concealed	15
4.	Sandstone, Webster Springs; makes small cataracts in bed of Elk River	--

In the Snyder Knob Section the Droop is 35 feet thick, reddish-brown, and flaggy, as exposed on the western slope of Cheat Mountain.

In Dry Fork District the Bickle Knob Section records it as 10 feet thick, green, and flaggy. On the east side of Shavers Fork just southeast of Woodrow it makes a greenish-brown, flaggy cliff, 30 feet thick, at elevation 2475' B. The Evenwood Section shows it to be greenish-brown, flaggy, and cross-bedded, and 10 feet thick, as exposed at elevation 2865' B. along the road west of the village. In the valley of Dry Fork of Cheat River this member, in conjunction with the Webster Springs Sandstone below it, usually makes a series of twin cliffs which are a prominent part of the topography. The Hazelwood Section records it as a massive cliff, 15 feet thick, at elevation 2895' B. In the Job Knob Section it is greenish-brown, flaggy, and 80 feet thick, making a cliff at elevation 2900' B., and holding up a shoulder of the Allegheny Mountain. The Haines Knob Section shows it as 25 feet thick, green, thick-bedded, and hard, making a cliff at elevation 2845' B. In the Whitmer Section it is 25 feet thick, green, and thin-bedded, making a cliff at elevation 3355' B. In the Osceola Section it is greenish-brown, flaggy, and 30 feet thick, as exposed in Yokum Knob at elevation 2475' B. On the west side of Rich Mountain west of Dry Fork it is exposed north of a private road 2.3 miles southwest of Gandy at elevation 3310' B., making a cliff and being greenish-brown, thick-bedded, and 15 feet thick.

Generally the Droop Sandstone does not appear to offer much possibility as a building stone owing to its frequent bedding-planes. In some localities, however, these largely disappear and its use could therefore be considered.

Talcott Shale.

The Talcott Shale of Reger[30], coming just below the Droop Sandstone, is five to 15 feet thick in southern Randolph, being usually red, with occasional streaks of dark, carbonaceous limestone. In Summers and other southern counties it carries marine fossils but these were not observed in Randolph. The writer has previously expressed the opinion that this shale is of the same approximate age as the higher part of the Clore Formation in western Kentucky and if this is true it should of course correlate with some portion of the same formation at its type locality in Randolph County, Illinois, the Clore Formation being the youngest member of the Chester Series as described in those two States.

In Huttonsville District the Talcott Shale is noted in the

[30]Ibid., pp. 418-421.

Cromer Top Section as red and 30 feet thick. In **Dry Fork District** it is recorded in the Evenwood Section as 15 feet thick, red, but partly concealed. In the Haines Knob Section it is 10 feet thick, being mostly red shale but having streaks of limestone.

Ada Shale.

The **Ada Shale** of Reger[31], coming just below the Talcott but differing so materially from the latter as to indicate a slight disconformity between the two, is a constant member of the Bluefield Group in southern Randolph. As a rule it is green, fissile, and calcareous, varying from 10 to 50 feet in thickness, and often containing abundant marine fossils, including pelecypods, gastropods, crinoids, and brachiopods, **Spirifer pellaensis** being one of the common forms of the latter. In some localities, also, fish teeth may be observed. In Mercer and other southern counties this shale is extremely rich in fossils, especially fenestelloids, and it has been traced northeastward to Randolph County, being a most valuable correlation unit and being evidently of Clore age.

In Randolph the most northern observed occurrence of Ada Shale is in **Leadsville District** along the old Morgantown Pike just southeast of the Laurel Ridge summit, at elevation 2575′ B., where it is five feet thick, greenish-yellow, and contains pelecypods and brachiopods. In **Beverly District** it is recorded in the Beverly Section as occurring along the Staunton and Parkersburg Pike on the eastern slope of Rich Mountain at elevation 2865′ B., being green, fissile, 10 feet thick, and carrying fragments of pelecypods. In **Huttonsville District** it is visible in the same highway along the western slope of Cheat Mountain at elevation 3170′ B., being green, calcareous, 30 feet thick, and carrying marine fossil fragments, as noted in the Cromer Top Section. On the same road going down the eastern slope of Back Allegheny Mountain in the edge of Pocahontas County, it was noted at elevation 3475′ B., being green, fissile, fucoidal, and 10 feet thick, as recorded in the Durbin Section.

In **Mingo District** it is visible in the State road at the eastern end of Point Mountain slightly west of Monterville, as noted in the Valley Head Section, being green, fissile, calcareous, and 30 feet thick, and carrying brachiopods among which **Spirifer pellaensis** was noted. In the county road at the head of Ralston Run 1.7 miles southeast of Blue Spring it was noted at elevation 3050′ B., having a thickness of 10 feet and being dark-green and fissile.

In **Dry Fork District** it is well exposed along the Elkins-

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[31]Ibid., pp. 421-26.

PLATE XXVII.—View from Kelley Mountain, looking northeast across valley of Shavers Fork. High point at left is Bickle Knob capped by Pottsville and followed below by Mauch Chunk, Greenbrier, and Pocono, with Catskill along river. (Photo. by E. E. Harris.)

PLATE XXVIII.—View from top of Middle Mountain one mile north of Wymer, looking west through gap of Shavers Mountain (in middle distance), with Big Knob at left of gap and with Bickle Knob in extreme middle background, both capped by Pottsville. Low hills in foreground are mostly Catskill. (Photo. by E. E. Harris.)

PLATE XXIX.—View from top of Middle Mountain one mile north of Wymer, looking southeast across valley of Laurel Fork toward Rich Mountain of which Haines Knob, capped by Pottsville, is the central peak. At extreme left rear Allegheny Mountain is visible through gap. Mauch Chunk and Greenbrier make up lower slope of Rich Mountain with low Catskill hills in foreground. (Photo. by E. E. Harris.)

PLATE XXX.—View from lower slope of Kelley Mountain looking east up valley of Shavers Fork with Pond Lick Mountain in rear, capped by Pottsville and followed below by Mauch Chunk, Greenbrier, Pocono, and Catskill, with a Chemung dip slope in immediate foreground. (Photo. by U. S. Forest Service.)

Franklin road slightly west of Evenwood, at elevation 2850′ B., as recorded in the Evenwood Section. Here it is dark-green, fissile, calcareous, and 30 feet thick, and carries a rather diverse marine fauna, including brachiopods (**Orthotetes, Diaphragmus, Productus,** and **Spirifer pellaensis**), pelecypods (**Pectens?**), and ostracods. In the Haines Knob Section it is noted as occurring along the same road on the eastern side of Rich Mountain, being 48 feet thick, green, fissile, and calcareous and carrying brachiopods, gastropods, crinoids, a fish tooth, and possibly other forms. On the west side of the same Rich Mountain range it was observed along a private road 2.4 miles southwest of Gandy at elevation 3275′ B., being green, fissile, and 10 feet thick.

Reynolds Limestone.

The **Reynolds Limestone** of Reger[32], coming just beneath the Ada Shale, is frequently visible in southern and eastern Randolph, being usually gray and shaly with a thickness of 5 to 25 feet, and containing marine fossils in profusion among which **Orthotetes kaskaskiensis** is one of the most common and conspicuous forms. This limestone is of evident Clore age and it is also possible that it may be the **Little Lime** of the West Virginia oil fields although proof of such a theory is still lacking, as there is a possibility that the Glenray Limestone, also, may extend northwestward into the oil fields and hence a further possibility that either or both of these formations may have been called Little Lime.

In **Beverly District** the Reynolds Limestone is noted in the Beverly Section as outcropping along the Staunton and Parkersburg Pike on the eastern slope of Rich Mountain at elevation 2860′ B., being only two feet thick, but dark and hard and carrying marine fossil fragments among which a **Spirifer** was doubtfully recognized. In **Huttonsville District** it was noted on the same highway along the western slope of Cheat Mountain at elevation 3125′ B., as recorded in the Cromer Top Section, being gray and 25 feet thick and carrying crinoids and brachiopods.

In **Mingo District** it is well exposed in the State road ascending the eastern end of Point Mountain at elevation 3110′ B., one-half mile northwest of Monterville, as detailed in the Valley Head Section. Here it is 25 feet thick, dark-gray, and shaly and carries abundant marine fossils from which a collection (**Lot 378**) was secured. As discussed in Chapter XV, Dr. Tilton identified from this collection crinoid stems, **Orthotetes kaskaskiensis, Productus ovatus, Diaphragmus**

[32]Ibid., pp. 426-430.

elegans, Spirifer pellaensis, Composita trinuclea, Composita subquadrata, Straparollus planidorsatus, and Myalina sp.

In the Mingo Section it is noted as visible in the hill just west of Mace, being shaly and 30 feet thick, and containing Orthotetes, Spirifer pellaensis, Composita, and possibly other forms. In the Elk Mountain Section it is dark, shaly, and 30 feet thick, with abundant marine fossils, including Spirifer pellaensis, Orthotetes, Composita, and Productus. On the head of Ralston Run 1.7 miles southeast of Blue Spring it is visible in the county road at elevation 3040′ B., being five feet thick and shaly and carrying Orthotetes, Spirifer pellaensis, Composita, Productus?, and gastropods. Blue Spring, on Valley Fork of Elk, issues from this limestone at elevation 2765′ B. Here there is a visible thickness of 10 feet and the rock is blue and shaly, carrying Composita, Spirifer pellaensis, Productus, Diaphragmus, and possibly other marine forms.

At Lovers Leap in the eastern edge of Webster Springs the Reynolds Limestone is four feet thick, yellow, and impure, as exposed in the road cut five feet above the top of the Webster Springs Sandstone at the type locality of the latter, as will be later exhibited under the discussion of this sandstone.

In Dry Fork District the Bowden Section records the Reynolds as shaly and making only a fragmentary exposure along a trail west of Taylor Run at elevation 2485′ B., but containing marine fossils. On the east side of Shavers Fork 0.3 mile north of Woodrow it was noted along an old trail at elevation 2405′ B., the visible exposure being three feet thick, dark-gray, and hard, and containing gastropods and crinoids. In the east bank and bed of Shavers Fork 0.5 mile south of Woodrow it is again visible at elevation 2360′ B., with a thickness of 10 feet. In the Evenwood Section it is recorded as one foot thick and shaly but as carrying Orthotetes. In the Harman Section it is one foot thick; and in the Haines Knob Section it is two feet thick and shaly but carries marine fossils, including Orthotetes, Composita, Spirifer pellaensis, crinoids, and possibly other forms, as exposed in the Rich Mountain road west of Job.

As an economic factor this limestone has small virtue beyond its capacity to weather into rich soil, as it is almost invariably too shaly and impure for use.

Bickett Shale.

The Bickett Shale of Reger[33], filling the gap between the Reynolds Limestone and Webster Springs Sandstone, may be noted with considerable regularity in southern Randolph,

[33]Ibid., pp. 430-31.

being red or shaly and five to 25 feet thick. Its principal interest lies in the fact that it is the most persistent streak of red shale to be found in the calcareous lower portion of the Bluefield Group. In **Mingo District** it is recorded in the Valley Head Section as 30 feet thick, red, and sandy. In the Mingo Section it is visible in the State road summit at Mace, 15 feet thick, and red. In the Elk Mountain Section it is red, calcareous, and 30 feet thick. In **Dry Fork District** it is noted in the Bowden Section as red, 40 feet thick, but partly concealed. In the Evenwood Section it is red and 50 feet thick; and in the Haines Knob Section it is red and five feet thick.

Webster Springs Sandstone.

The **Webster Springs Sandstone** of Reger[34], coming just beneath the Bickett Shale, is a prominent unit of the Bluefield Group in southern and eastern Randolph. Generally it is greenish-gray or greenish-brown, thick-bedded, micaceous, and hard, with a thickness of 20 to 50 feet but at some localities greatly exceeding these figures. Like nearly all the other sandstones of the Mauch Chunk it is mostly without paleontological implication although it occasionally carries plant stems. By inference, however, it would be of approximate Palestine age when compared to the standard Chester column of the Mississippi Valley, as the Reynolds above it seems to be Clore and the Glenray below it is quite positively of Menard age.

In **Beverly District** the Elkhorn School Section records it as 15 feet thick, green, and flaggy. In **Huttonsville District** the Cromer Top Section notes it as 15 feet; and the Durbin Section shows it to be 20 feet thick, red, and cross-bedded. In **Mingo District** it is recorded in the Valley Head Section as 60 feet thick, greenish-gray, and thick-bedded, as exposed in the new State road ascending Point Mountain just west of Monterville at elevation 3145′ B. In the old county road 0.2 mile northwest of Monterville it has a visible thickness of 50 feet at elevation 3080′ B., being brown, coarse, and massive and containing many plant stems. **Fossil Lot 452** was collected at this point and forwarded to Dr. David White at Washington whose report has not yet been prepared. Some of these stems, however, are recorded in the notes of the writer as **Calamites?** and hence may prove to be **Bornia radiata (Asterocalamites scrobiculatus)** which is a common Mauch Chunk form.

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[34]David B. Reger, Webster Rept., W. Va. Geol. Survey, pp. 227-8; 1920.

In the Snyder Knob Section this sandstone is 15 feet thick, green, flaggy, and hard. In the Webster Springs Section it is 35 feet thick, greenish-gray, and hard, as exposed just north of the Back Fork highway bridge. At the eastern end of the Springs at Lovers Leap the following section is now exposed at the type locality of the Webster Springs Sandstone and shows the relationship to higher formations which were not visible when the Webster Report was prepared:

	Feet.
1. Sandstone, shaly, visible	10
2. Shale, green, sandy	5
3. Limestone, Reynolds, yellow, impure	4
4. Shale, Bickett, red, partly concealed (1535' B.)	5
5. Sandstone, Webster Springs (type locality), greenish-gray, micaceous, medium-hard, massive or current-bedded, to Elk River	55

In the original description of the Webster Springs Sandstone the statement was made that its base was not exposed in Elk River at this point but that it evidently rested on the top of the Greenbrier Limestone. This statement was based on a mistaken belief that the limestone which outcrops just above drainage at and near the junction of Elk and Back Fork was the top of the Greenbrier and was due to the fact that no definition of the true contact of Greenbrier and Mauch Chunk in West Virginia had yet been made. It is now apparent that this calcareous stratum about the Springs is the Glenray Limestone of the Mauch Chunk and that the Greenbrier is entirely below drainage. A reference to the Webster Springs Section on pages 180-2 of the present Report will show that the lowest visible formation is the Edray Sandstone of early Bluefield age.

Passing up Elk above Webster Springs the Webster Springs Sandstone is partly exposed at Cherry Falls slightly east of Lovers Leap, and makes low cataracts in the river at the foot of the Point Mountain road 1.6 miles southeast of the Springs, as previously detailed under the discussion of the Droop Sandstone, page 302. At the Webster-Randolph County line the lower part of this member makes the Whitaker Falls as detailed in the Whitaker Falls Section. In the Elk Mountain Section it is recorded as 30 feet thick, making a massive cliff. From Whitaker Falls eastward along Elk and up Valley Fork nearly to Blue Spring the ledge is prominent, its broken remnants littering the highway and making travel difficult. Farther up main Elk it is visible at various points and in the hillside just northwest of Swacker School the following relationship was observed:

		Feet.
1.	**Sandstone, Webster Springs,** greenish-gray, thick-bedded, hard (2535′ B.)	20+
2.	Concealed, with dark-green shale	50
3.	**Limestone, Alderson,** dark, partly hard, and partly shaly, cavern at base, visible	50

In **Dry Fork District** the Webster Springs Sandstone is recorded in the Bickle Knob Section as 50 feet thick, greenish-gray, and cross-bedded at elevation 2865′ B. In the Bowden Section it is 20 feet thick, green, and flaggy. In the Collett Gap Section it is 14 feet thick, green, thick-bedded, and hard. On the west side of West Fork of Glady Fork 2.3 miles south of Glady town it is visible in Shavers Mountain about 200 feet above the Union Limestone, making a shaly or flaggy cliff about 30 feet thick. This observation was made from the railroad and hence the figures are only approximate. On the west side of the Rich Mountain range which lies west of Dry Fork it is visible along a private road 1.3 miles southwest of Dry Fork School, being 10 feet thick, greenish-brown, thick-bedded, and making a cliff at elevation 3210′ B., and being about 100 feet below the Droop Sandstone. On the west side of the same mountain two miles northwest of Pharis Knob it is 10 feet thick at elevation 3680′ B. This is at the William Adamson farm, as later detailed under the description of the Union Limestone.

In the Dry Fork Valley it may be observed at many points making a prominent cliff and being about 100 feet below the Droop Sandstone which is also a frequent cliff. In the Haines Knob Section it is 30 feet thick, greenish-brown, and shaly. In the point between Dry Fork and Stinking Run just south of Job it makes a ten-foot cliff, the elevation of the top being 2755′ B. Its relationship to other Bluefield members is well illustrated by the following local section on the north side of Stinking Run 0.7 mile east of Job:

		Thickness. Feet.	Total. Feet.
1.	Sandstone, green, flaggy, makes wide shoulder	20	20
2.	Concealed, with red shale	75	95
3.	**Sandstone, Droop,** greenish-brown, cross-bedded, cliff (3150′ B.)	50	145
4.	Concealed and green, fissile shale, **Talcott and Ada Shales**	50	195
5.	**Limestone, Reynolds,** shaly, streak	--	--
6.	**Shale, Bickett,** red, partly concealed	45	240
7.	**Sandstone, Webster Springs,** greenish-		

		Thickness. Feet.	Total. Feet.
	brown, thick-bedded, hard, medium-coarse (3035′ B.)	20	260
8.	Shale, red, partly calcareous	40	300
9.	Limestone, Glenray, gray, hard	10	310
10.	Concealed, with dark-green shale, Lillydale (2955′ B.)	30	340
11.	Limestone, Alderson (of Greenbrier Series), dark, weathering yellow; contains pelecypods, brachiopods, crinoids, and cup corals; top exposed along road	--	340

At the head of Stinking Run the Webster Springs Sandstone may again be noted along the Randolph-Pendleton line at elevation 3260′ B., making a ten-foot cliff, as later detailed under the description of the Alderson Limestone. On the west side of Dry Fork 1.2 miles south of Job it is 10 feet thick and greenish-brown, at elevation 2740′ B. In the Whitmer Section it is five feet thick, greenish-red, and flaggy. On the west side of Dry Fork, opposite Mullenax Run, it is five or ten feet thick at elevation 2875′ B. On the east side of Dry Fork 0.9 mile south of and above Mullenax Run it is 10 feet thick at elevation 2990′ B.; and about 120 feet above it the Droop makes a 20-foot cliff. On the west side of Dry Fork 1.3 miles above Mullenax Run the following exposure was noted:

		Feet.
1.	Sandstone, Webster Springs, greenish-brown, thick-bedded, hard (3050′ B.)	10
2.	Concealed	30
3.	Limestone, Glenray, yellow, shaly; contains crinoids and brachiopods (2975′ B.)	45
4.	Concealed, with calcareous shale, Lillydale	20

On the west side of Dry Fork in the hill northwest of the road fork 5½ miles above the junction of Dry Fork and Gandy Creek the Webster Springs Sandstone is visible at elevation 3435′ B., with a thickness of five feet and a greenish-brown color. On the west side of Dry Fork 0.9 mile west of Pharis Knob it is 10 feet thick, green, and thick-bedded at elevation 3620′ B. Here the Droop is also visible, making a fifteen-foot cliff at 100 feet or more above the Webster Springs.

The economic possibilities of the Webster Springs Sandstone can not easily be detailed in general terms. In the Elk River Valley and particularly along Valley Fork it is sufficiently massive at certain points to be used successfully as a building stone and its architectural effect would be good. At many points, however, it is too thin-bedded or shaly to be useful.

Glenray Limestone.

The **Glenray Limestone** of Reger[35], coming next under the Webster Springs Sandstone, is a prominent formation in southeastern Randolph but its occurrence is not frequent in the northern and western parts. As a rule it is dark-gray and shaly or sandy but in the upper valley of Dry Fork it becomes pinkish-gray, hard, and fairly pure, its thickness ranging up to 25 feet. Generally it contains abundant marine fossils, including brachiopods, crinoids, cup corals, and blastoids, as will be later detailed. On the basis of its position and faunal content and especially because of the presence of **Sulcatopinna missouriensis** which it carries in certain southern counties there can be little question that this bed is of Menard age, as previously affirmed by the writer.

In **Middle Fork District** the Glenray does not outcrop but in the Arvondale Junction Section the Little Lime, which in this case may be the Glenray as it is only 13 feet above the top of the Greenbrier, is 10 feet thick. In **Leadsville District** it is noted in the Aggregates Section as 10 feet thick, dark, and carrying marine fossils. **Sample No. 654R** was collected here for chemical analysis, as will be discussed in Chapter XI under the subject of "Limestone". In **Beverly District** it makes a good exposure in Pond Lick Mountain above the Faulkner Quarry of the Monongahela Construction Company, as will be later detailed in Chapter XI. In **Huttonsville District** it is visible along the Staunton and Parkersburg Pike on the west side of Cheat Mountain at elevation 3085′ B., being dark, siliceous, 30 feet thick, and carrying marine fossils, as noted in the Cromer Top Section. On the same road on the east side of Back Allegheny Mountain it is exhibited in the Durbin Section as 30 feet thick, and red, carrying marine fossils, principally crinoids.

In **Mingo District** it is recorded in the Mingo Section near Mace as 10 feet thick, shaly, siliceous, and impure. At Webster Springs, as indicated in the Webster Springs Section, page 182, it thickens to about 50 feet and contains numerous marine fossils. **Fossil Lot 455** was collected at this point by the writer and from this collection Dr. Tilton reports impressions of plant stems, crinoid stems, branching bryozoa, **Stenopora** sp., **Archimedes** sp., **Orthotetes kaskaskiensis** (numerous), **Productus?**, **Diaphragmus elegans**, **Spirifer pellaensis**, and **Straparollus planidorsatus** (indistinct), as will be later discussed by him in Chapter XV.

In **Dry Fork District** the Glenray is recorded in the Bickle Knob Section as 40 feet thick, gray, and fairly pure

[35]David B. Reger, Mercer-Monroe-Summers Rept., pp. 432-437, W. Va. Geol. Survey; 1926.

but partly concealed, carrying crinoids and other marine fossils. In the Laneville Section it is 25 feet thick and hard. In the Harman Section it is 20 feet thick and shaly, carrying numerous crinoids. In the Job Knob Section it is 25 feet thick and shaly. In the Haines Knob Section it is 20 feet thick and carries marine fossils but is not well exposed. On Stinking Run 0.7 mile east of Job it is gray and hard with a thickness of 10 feet, as detailed in a local section under the discussion of the Webster Springs Sandstone, page 310. At the head of Stinking Run it is exposed along the Randolph-Pendleton line, being 30 feet thick, greenish-yellow, and hard, at elevation 3200' B., and carrying crinoids and brachiopods, as later detailed in connection with the Alderson Limestone. In the Whitmer Section it is 45 feet thick, gray, but tinged with pink, hard, and pure and carries crinoids and other marine fossils. On the east side of Dry Fork 0.7 mile northwest of Pharis Knob it has a visible thickness of 20 feet, the elevation of its top being 3565' B. On the west side of Rich Mountain at the William Adamson farm, 2.2 miles northwest of Pharis Knob, it is exposed at elevation 3630' B., being partly gray and weathering white, and partly yellow, and mostly hard and pure, with a thickness of 15 feet, as later detailed in connection with the Union Limestone. On the west side of the same mountain, 1.4 miles northwest of Yokum Knob, it is pinkish-gray, hard, and fairly pure, making a high shoulder on the mountain, the visible exposure being 20 feet thick and the elevation of its top being 3810' B. In the Osceola Section, as exposed along the southern slope of Yokum Knob, it is pinkish-gray, pure, and 15 feet thick, carrying crinoids, cup corals, and blastoids (**Archimedes**).

The chemical quality and possible economic uses of the Glenray Limestone will be discussed in Chapter XI, under the subject of "Limestone".

Lillydale Shale.

The **Lillydale Shale** of Reger[36], coming just below the Glenray Limestone and, with its included lenticular **Edray Sandstone**, forming the basal portion of the Bluefield Group, is a constant and easily recognized formation in southern and eastern Randolph. In some localities it is red but usually it is dark-green, fissile, and calcareous with occasional nodules of iron carbonate, and with a thickness varying from 10 to 50 feet. It often carries numerous marine fossils including brachiopods (**Orthotetes, Spirifer pellaensis, Composita, Productus inflatus**, etc.), pelecypods (**Sulcatopinna**, etc.), crinoids, and fenestelloids. Its lower part often contains the

[36]Ibid., pp. 437-443.

Edray Sandstone which is lenticular. The presence of **Sulcatopinna missouriensis** which is found in this shale in West Virginia and southwestern Pennsylvania, classes it rather definitely as of Menard age. This shale, beyond much doubt, is also the **Pencil Cave** of the West Virginia oil fields.

In **Leadsville District**, as detailed in the Aggregates Section, page 150, this shale is 32 feet thick, partly green and partly red, and carrying marine fossils among which pelecypods and brachiopods (**Orthotetes, Spirifer, Composita,** etc.) were noted. At this locality, just south of the Aggregates limestone tipple, a chemical sample (**No. 653R**) was collected, from the land of **Gates & Bailey**, the analysis of which is reported as follows by Kaplan:

	Per cent.
Silica (SiO_2)	58.34
Ferric Iron (Fe_2O_3)	3.30
Alumina (Al_2O_3)	29.02
Lime (CaO)	0.04
Magnesia (MgO)	0.39
Potash (K_2O) and Soda (Na_2O)	1.87
Loss on Ignition	6.94
Total	99.90

The high alumina content of this shale at this point is of particular interest because of the possible use of the shale as a mixing agent for cement purposes in connection with the limestones of the Greenbrier Series which could be quarried from the same hillside, as will be further discussed in Chapter XI.

In **Beverly District** the Lillydale Shale is 22 feet thick above the Faulkner Quarry of the Monongahela Construction Company in the foot of Pond Lick Mountain, as will be later detailed in the descriptions of Chapter XI. In **Huttonsville District** it is noted in the Durbin Section across the Pocahontas County line, being partly green and partly red, and 15 feet thick. In **Mingo District** the Mingo Section shows it to be composed of two benches of five feet each, separated by the Edray Sandstone. Here a chemical sample (**No. 686R**) was collected from the upper shale bench at elevation 3470' B. on the land of the **F. P. Marshall Heirs** along the public road at Mace, the same being reported as follows by Kaplan and Sigwart:

	Per cent.
Silica (SiO_2)	61.68
Ferric Iron (Fe_2O_3)	7.14
Alumina (Al_2O_3)	18.10
Lime (CaO)	1.19
Magnesia (MgO)	1.73
Loss on Ignition	7.96
Undetermined	2.20
Total	100.00

In Dry Fork District the Bickle Knob Section shows it to be 60 feet thick but all covered; and the Bowden Section noted it as 10 feet but covered. The following interesting exposure was noted along the Elkins-Franklin road south of Taylor Run and 0.9 mile east of Bowden:

	Feet.
1. Shale, red, mostly concealed	--
2. Shale, Lillydale, green, partly sandy and partly calcareous, with marine fossils, brachiopods (Productus, etc.), crinoids, fenestelloids, and pelecypods (fragments of Sulcatopinna, etc.)	5
3. Shale, Lillydale, red (2355′ B.)	6
4. Limestone, Alderson, dark, shaly, top of Greenbrier Series	--

A chemical sample (No. 697R) was collected at this point on the land of Sylvanus Vandevender from Nos. 2 and 3 of section, the composition of which is reported as follows by Kaplan and Sigwart:

	Per cent.
Silica (SiO_2)	55.60
Ferric Iron (Fe_2O_3)	7.24
Alumina (Al_2O_3)	18.01
Lime (CaO)	4.37
Magnesia (MgO)	2.48
Loss on Ignition	8.88
Undetermined	3.42
Total	100.00

The Evenwood Section records the shale as dark-green, calcareous and 25 feet thick with marine fossils, including brachiopods, pelecypods, and fenestelloids. In the Dry Fork Valley this shale may be studied at many localities. In the Laneville Section it is 40 feet thick but concealed. In the Harman Section it is five feet thick, red, calcareous and containing numerous marine fossils. In the Job Knob Section the combined thickness of Lillydale Shale and Edray Sandstone is 10 feet. In the Haines Knob Section the Lillydale Shale is 20 feet thick, red and green, and calcareous, outcropping at elevation 2670′ B., and containing marine fossils. On the north side of Stinking Run 0.7 mile east of Job it is 30 feet thick but partly concealed, as noted in the description of the Webster Springs Sandstone, page 310. On the head of Stinking Run at the Randolph-Pendleton line it is 30 feet thick, dark-green, and fissile, as later detailed in connection with the Alderson Limestone. In the Whitmer Section it is dark-red and 35 feet thick, but partly concealed. In the Osceola Section it is poorly exposed but has a thickness of 30 feet and is partly red.

The Lillydale Shale is of considerable economic importance because of its close association with the limestones of the Greenbrier Series which lie just below it and which may be eventually used for the manufacture of Portland cement in Rando'ph County. The shale should furnish convenient material for mixing with the lime to secure a proper chemical combination in the finished product. For brick-making purposes the same shale at many localities would not be suitable owing to its calcareous nature but this lime content would be no disadvantage in cement manufacture.

Edray Sandstone.

The **Edray Sandstone** of Reger[37], found as a lenticular bed in the lower part of the Lillydale Shale in the southern end of the county, is usually greenish-gray or greenish-brown and flaggy, with a thickness of 25 feet or more at certain localities. In **Mingo District** the Snyder Knob Section records it as 35 feet thick, green, thick-bedded, and hard. The Mingo Section shows it to be 30 feet thick, green, flaggy, and shaly, in the road just north of Mace, the United States Geological Survey Bench Mark of 3464' being set four feet below its top. In the Webster Springs Section there is five feet of it visible on the southern side of Elk River at the crossing of the anticline. At Slaty Fork, Pocahontas County, Paul H. Price reports it as 40 feet thick. In **Dry Fork District** the Bickle Knob Section records it as five feet thick, greenish-gray, and shaly at elevation 2760' B. In the Job Knob Section the combination of Lillydale and Edray is 10 feet. In the Whitmer Section it is five feet thick, green and flaggy at elevation 3195' B.

ECONOMIC ASPECTS, MAUCH CHUNK SERIES.

The Mauch Chunk Series contains no coals of minable thickness and purity in the county. Its sandstones, in general, are too shaly and flaggy for building stone but there are certain local exceptions as suggested in previous pages. Many of its red shales would be quite suitable for making building brick, building tile, or drainage tile and would burn to a red color. These shales make abundant outcrops and could be conveniently quarried at many points. Its limestones, with the possible exception of the Glenray, are generally too shaly for any economic purpose but in the event that a cement industry should develop in the county their chemical content might become of importance as possible mixing agents to reduce the calcium content of some of the Greenbrier limestones

[37]Ibid., pp. 443-4.

which would be the basic material. In a very considerable part of the county the sod lands which have afforded immense forage for sheep and cattle are found along the outcrops of the Mauch Chunk and Greenbrier. The value of these lands, which should continue to support such an industry without perceptible exhaustion, is very great.

GREENBRIER SERIES.

GENERAL ACCOUNT AND SECTION, GREENBRIER SERIES.

The Greenbrier Series of the Mississippian, next underlying the Mauch Chunk, is an assemblage of predominantly calcareous rocks, named from exposures in the Greenbrier Valley of West Virginia. As previously discussed by the writer[38] the term "Greenbrier" has long been in use having been employed by Stevenson, Rogers, I. C. White, and many others. The first definition of the formation as a series, however, and its first subdivision into individual members in West Virginia was made by Reger in 1926 in the publcation above cited. At the same time its upper and lower boundaries were fixed with the help of Dr. Geo. H. Girty, and a rather comprehensive comparison with its counterparts in other States, the full details of which have never been published, was undertaken and the field work largely completed. The collections made by the writer on this expedition, which included a study of the entire Mississippian column, are in the hands of Dr. Girty at Washington and should be of ultimate value when fully studied by him.

In Randolph County the Greenbrier has a thickness varying from 100 to 400 feet, which is only a fraction of its magnificent development in southern West Virginia and southwestern Virginia. Its position in the general stratigraphic column is illustrated by Figures 4 and 5 and the following general section indicates in more detail its nature in Randolph County:

General Section of the Greenbrier Series for Randolph County.

	Thickness. Feet.	Total. Feet.
1. Limestone, Alderson, (Glen Dean and Golconda age), dark-gray, weathering yellow, usually hard and somewhat sandy with a few crystalline streaks, but sometimes shaly, slightly oolitic at a few points; contains numerous marine fossils, bryozoa (principally Archimedes and fenestelloids), brachiopods (Composita,		

[38]David B. Reger, Mercer-Monroe-Summers Rept., W. Va. Geol. Survey, pp. 445-451; 1926.

		Thickness. Feet.	Total. Feet.
	Productus ovatus, Productus inflatus and others, **Orthotetes, Spirifer,** etc.), pelecypods, crinoids (including **Pterotocrinus**), cup corals, trilobites, and fish bones (see **Lots 372 and 377**); also contains plant fossils farther south in chalky beds above middle (see **Lot 305** on Back Allegheny, Pocahontas County, east of Cheat Bridge); generally occurs south and southeast of Elkins ----	40 to 60	60
2.	**Sandstone, Cypress,** green or red, shaly and calcareous, lenticular; appears to be the same horizon as **Greenville Shale** of Monroe County --------------------	0 to 10	70
3.	**Limestone, Union, (Gasper** portion), gray, dark-gray, or dove-colored, weathering white, usually pure and generally oolitic, hard, and often crystalline; contains marine fossils, brachiopods (**Productus, Orthotetes,** etc.), crinoids, cup corals, blastoids (**Pentremites**), trilobites, fish teeth (see **Lot 349**); quarried and crushed at Aggregates, Faulkner, and southeast of Bowden; burned for agricultural lime at numerous points ----------------------	40 to 60	130
4.	**Limestone, Union** (continued), (**Bethel Sandstone** stage), usually red, shaly, and calcareous with streaks of red shale; contains a few marine fossil fragments; may possibly represent the **Rosiclare Sandstone** instead of Bethel ---------------	10 to 20	150
5.	**Limestone, Union** (continued), (**Fredonia** portion), gray, dark-gray, or dove-colored, weathering white, usually hard, siliceous, and cross-bedded, oolitic, with occasional beds of red shale or shaly sandstone, often pure and crystalline; contains marine fossils which are generally fragmentary and hard to collect, brachiopods, small gastropods, crinoids, cup corals, blastoids (**Pentremites**); quarried and crushed at Aggregates, Faulkner, Bowden, and southeast of Bowden; burned for agricultural lime at various points -----	50 to 75	225
6.	**Limestone, Pickaway,** dark, hard, and sandy, stylolitic; contains a few marine fossils, crinoids and brachiopods; occurs principally in southern end of Tygart Valley --	0 to 50	275
7.	**Shale, Upper Taggard,** red or green, visible in southern end of Tygart Valley ------	0 to 5	280
8.	**Limestone, Taggard,** grayish-white, tinged with red, oolitic; visible in southern end of Tygart Valley --------------------	0 to 5	285
9.	**Shale, Lower Taggard,** red, calcareous, occurs in southern end of Tygart Valley --	0 to 10	295

	Thickness. Feet.	Total. Feet.
10. **Limestone, Patton**, dark-gray, tinged with red, hard and somewhat siliceous, slightly oolitic, stylolitic at top; quarried for road-metal in Mingo Flats; occurs only in southern end of Tygart Valley	0 to 50	345
11. **Shale, Patton**, red or sandy; contains plant fossils in Monroe County but none observed in Randolph; occurs only in southern end of Tygart Valley	0 to 5	350
12. **Limestone, Sinks Grove**, dark, weathering yellow, hard, amorphous, impure, slightly oolitic; contains marine fossils, brachiopods (**Orthotetes, Productus, Diaphragmus, Spirifer pellaensis?**), fenestelloids; occurs only in southern end of Tygart Valley	0 to 50	400
13. **Limestone, Hillsdale, (St. Louis age)**, dark, sandy, amorphous, impure; contains the coral **Lithostrotion** and many other marine fossils; forms the base of the Greenbrier Series in northern Pocahontas County but has not been observed in Randolph; probably absent	-- -- --	---
Subjacent formation in southern Randolph is the **Maccrady Series**, composed of yellow, **Warsaw? Limestone** and red shales; in northern Randolph the Maccrady is absent allowing the Greenbrier to rest directly on the **Pocono Series** of sandstones and sandy shales.		

SUBDIVISIONS, GREENBRIER SERIES.

The Greenbrier Series has not been subdivided into groups but some of its individual members include two or more named beds of the classical Mississippi Valley sections. The Union Limestone, for instance, includes the Gasper, Bethel, and Fredonia horizons and in Randolph County their separate designation and description would be easy. Farther south in West Virginia, where the series thickens nearly to its Appalachian maximum, the dividing sandstone disappears and no separation of the Union into its constituent parts appears to be practicable. The Alderson Limestone also represents two or three western members but it is not apparent to the writer that an attempt to separate these elements in West Virginia would be desirable.

TOPOGRAPHIC EXPRESSION, GREENBRIER SERIES.

The Greenbrier Series in Randolph County almost invariably outcrops along the slopes of mountain ranges where the dip is into the mountains rather than toward the valleys. It is bordered above by the soft shales of the Mauch Chunk

Series and buttressed below at many localities by the much harder rocks of the Pocono, there being at some points a slight cushion of Maccrady shale between, and at still other points a complete absence of the Pocono, allowing the Greenbrier to rest on the Catskill Series of the Devonian. In general, however, the practical effect is much the same, there being nearly always a wide topographic shelf at or near the base of the Greenbrier. This has been previously mentioned in this Report as the "Pocono-Greenbrier Shelf" and rather clearly suggests the topographic form which may be anticipated at almost any Greenbrier outcrop. On account of its fertile soil and comparatively easy topography the Greenbrier outcrop at most points in the county has been cleared and settled and is usually followed by some sort of a mountain highway or trail.

In some localities, like the Mingo Flats and the Osceola region, the Greenbrier outcrop widens considerably and has been perforated by sinks in which the water almost invariably has penetrated to the Pocono floor. Few, if any, of these sinks have been refilled with mud so as to hold water and in that respect they differ from the more extensive karst country of Greenbrier and Monroe Counties.

AREAL EXTENT, GREENBRIER SERIES.

Figure 9 shows at a glance the areal extent of the Greenbrier Series in Randolph County and on Map II its outcrop is indicated in more detail. In **Roaring Creek** and **Middle Fork Districts** it does not outcrop. In **New Interest District** it is confined to a narrow strip along the eastern slope of Laurel Ridge. In **Leadsville District** it is found along the eastern slopes of Laurel Ridge and Rich Mountain and in the gap of Tygart River between these ranges; and also in two small areas on the western slopes of McGowan and Cheat Mountains. In **Beverly District** there is a strip along the eastern slope of Rich Mountain and another on the western side of Cheat Mountain. This latter outcrop extends northeastward around the northern end of Pond Lick Mountain and continues eastward and southward up Shavers Fork two or three miles beyond Bowden. In **Valley Bend District** it is found on the eastern slope of Rich Mountain and the western side of Cheat Mountain. In **Huttonsville District** it occurs on the eastern slope of Rich Mountain, in the lower valley of Mill Creek, and on the western side of Cheat Mountain. In **Mingo District** its upper portion is above drainage along Elk River from the mouth of Valley Fork to the Pocahontas line; farther north a full outcrop starts at the district line on the headwaters of Elkwater Fork, extends southward along the eastern slope of Rich Mountain, passes through Monterville and just west of Mingo; and then curls eastward around the southern end of Tygart Valley and goes northward along the western slope of Cheat Mountain to the district line at Stewart Run.

In **Dry Fork District** the Greenbrier is exposed along the western slope of McGowan Mountain, curling eastward around the southern side of Bickle Knob and continuing through the Shavers Fork Valley to Bowden and thence southward for two or three miles. Farther east it makes long outcrops on the eastern slope of Shavers Mountain and the western side of Rich Mountain which lies west of Dry Fork. In the main Dry Fork Valley it is found at the northern end of Rich Mountain and thence follows the same range southward to Harman where it joins a similar outcrop coming from the Laneville region of Red Creek. Southward from Harman its base soon goes under drainage but its upper part follows the valley nearly to its head. East of the river, however, the eastward rise of the rocks exposes a full outcrop on both sides of the upper waters of Horsecamp Run east of Harman, continuing to the Pendleton County line, and a partial outcrop on Stinking Run, extending from Job to the Pendleton line. On Gandy Creek north of Whitmer one branch of the outcrop goes eastward to the gap of Allegheny Mountain and then turns northward into Pendleton County; but on the west side of the creek a full outcrop follows the eastern slope of Little Middle Mountain into the sinks near Osceola and continues to the Blister Swamp where it turns northward through the headwaters of Laurel Fork and finally joins the long exposure previously mentioned on the western side of Rich Mountain.

CONTACTS, GREENBRIER SERIES.

The upper contact of the Greenbrier Series with the Mauch Chunk has already been discussed in the description of the latter series, page 284, there being no great unconformity although the division plane is logical and may be readily followed. At the base of the Greenbrier the relationships are more involved and there is a very considerable unconformity but without any exhibition of angularity. At the head of Tygart Valley the Greenbrier rests on a thin cushion of Maccrady, the shales and yellow limestones of which are distinctive. Northward the Maccrady soon disappears, allowing the Greenbrier to rest on the sandy ledges of the Pocono Series when the latter itself is present. In many localities, however, notably in certain parts of Rich Mountain west of Tygart Valley, in Laurel Ridge, and in Shavers Moun-

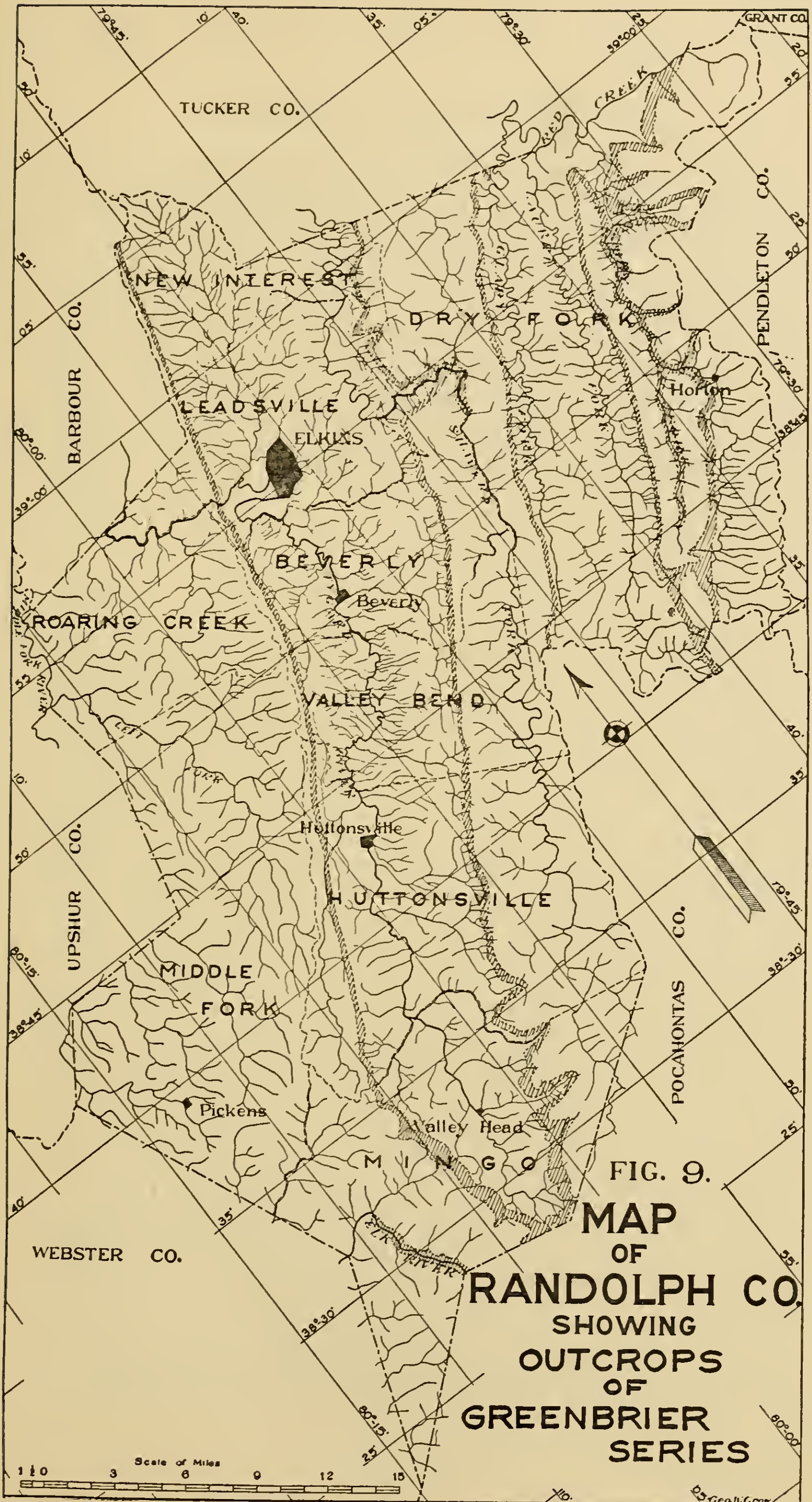

FIG. 9.

MAP OF RANDOLPH CO. SHOWING OUTCROPS OF GREENBRIER SERIES

tain, the Pocono itself is completely absent, and the Greenbrier is found directly on the red beds of the Catskill Series of the Upper Devonian. Some of these local cut-outs are noted in the measured sections of Chapter V but they are not indicated on Map II. In the Greenbrier itself there is considerable disconformity at the base, the Hillsdale (St. Louis) member being apparently absent at all points and the Sinks Grove, Patton, Taggard, and Pickaway being also absent over a considerable portion of the central and northern parts of the county, allowing the Fredonia portion of the Union to make the base of the series. On the old Morgantown Pike just southeast of the summit of Laurel Ridge the entire Greenbrier appears to be absent. Such a condition was not noted elsewhere.

FOSSIL LIFE, GREENBRIER SERIES.

On account of its calcareous nature plant life would hardly be anticipated in the Greenbrier but in southern West Virginia there are some extremely interesting floral occurrences, notably in the Alderson Limestone and in the Patton Shale between the Patton and Sinks Grove Limestones. The Alderson flora, consisting mostly of plant stems, has been traced northeastward by the writer as far as the eastern slope of Back Allegheny Mountain, Pocahontas County, between Durbin and Cheat Bridge. Here these old stems may be seen in considerable quantity along the Staunton and Parkersburg Pike. A collection (Fossil Lot 305) made by the writer at this point is now in the hands of Dr. David White at Washington. Another instance of plant life occurs at the Aggregates Quarry of Gates and Bailey northwest of Elkins where some small, silicified tree trunks, three or four inches in diameter, were found in the lower part of the Union Limestone. This collection (Fossil Lot 463) was examined by Dr. Tilton but the remnants proved to be indistinguishable, as discussed by him in Chapter XV.

In marine fossils the Greenbrier is often quite rich in Randolph County, although lacking some of the features found in southern West Virginia. Quite often, also, the limestone is so hard that the specimens may scarcely be removed without destruction. Fossil Lots 349, 372, and 377 were collected in the county and have been examined by Dr. Tilton whose comment appears in Chapter XV. The necessity of investigating many other, and in some respects more important, features of the geology of Randolph County made it impossible to spend much time on Greenbrier collections.

CORRELATION, GREENBRIER SERIES.

In a former publication the writer[39] has already expressed his views relative to the correlation of the Greenbrier Series of West Virginia with rocks of similar age in other States. Briefly summarized, it seems apparent that the upper members, including the Alderson, Cypress (Greenville), and the Union, are of Chester and Ste. Genevieve age, but that the lower beds are older, depending on what authority may finally prevail relative to the disputed lower contact of the Chester with the Meramec. It is apparent, also, that the Pickaway, Taggard, Patton, and Sinks Grove have no correlatives and do not exist, or at least have not been described, in the Mississippi Valley. These formations reach their maximum development in southern West Virginia and the adjacent portion of southwestern Virginia and appear to be entirely local to the two States. In a recent publication by Butts[40] they have been assigned to the Ste. Genevieve in southwestern Virginia, because of the presence of **Platycrinus penicillus (huntsvillae), Cystelasma,** and possibly other fossils regarded as distinctly Ste. Genevieve in the west. On this matter the writer believes that clarity of usage in the Appalachian States will best be preserved by putting into the Ste. Genevieve no strata below the base of the Fredonia portion of the Union Limestone. These lower beds between the Fredonia and the St. Louis do not exist in the west but in the east they form a new and quite locally distinct column of more than 1000 feet and the fact that they contain fossils which also occur in the Ste. Genevieve is merely evidence that the true range of the fossils has now been extended into lower beds and their correlative value has been impaired. Geologic science is full of such instances, and formation boundaries of long standing can hardly be shifted to accommodate them.

At the base of the Greenbrier there seems to be little doubt that the Hillsdale Limestone is clearly correlative with the St. Louis. The St. Louis, with its distinctive fossils, has now been traced to northern Pocahontas County, West Virginia, beyond which it has not been observed at any locality.

There is rather good ground for belief that the Union Limestone of the Greenbrier correlates in large part, if not entirely, with the Maxville of Ohio. The Union Limestone, also, has been traced by the writer into Pennsylvania where its lower, or Fredonia, portion becomes siliceous and repre-

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[39]David B. Reger, Mercer-Monroe-Summers Rept., W. Va. Geol. Survey, pp. 460-462; 1926.

[40]Chas. Butts, Oil and Gas Possibilities at Early Grove, Scott County, Virginia, Va. Geol. Survey, Bull. 27; 1927.

sents the Loyalhanna, a short distance above which the Gasper portion is easily recognized. Farther northeast, in the Broadtop Basin, the two limestone benches of the Union, together with their included sandstone, represent the constituent parts of the Trough Creek Limestone, as previously discussed by the writer[41] in more detail.

DESCRIPTION OF MEMBERS, GREENBRIER SERIES.

Alderson Limestone.

The **Alderson Limestone** of Reger[42], belonging at the top of the Greenbrier Series in southern West Virginia, is generally, though not always, present in Randolph County. As a rule it is dark-gray, weathering yellow, hard and somewhat sandy with some crystalline streaks, but sometimes shaly, slightly oolitic at a few exposures, and ranging from 40 to 60 feet thick. At nearly all occurrences it carries marine fossils among which are bryozoa, (principally **Archimedes** and fenestelloids), brachiopods (**Composita, Productus ovatus, Productus inflatus** and others, **Orthotetes, Spirifer,** etc.), pelecypods, crinoids, (including **Pterotocrinus**), cup corals, trilobites, and fish bones. In the counties southwest of Randolph it rather consistently carries a plant fossil horizon in which there are numerous carbonized remnants of plant stems, but these are not much in evidence in this county. This limestone is of Glen Dean and Golconda age, as confirmed by its fauna and by direct tracing southwestward through Virginia into Kentucky.

In **Leadsville District** the Alderson is exposed at the Aggregates Section where it is 40 feet thick, mostly dark and yellow, and contains crinoids and other fossils. A chemical sample (**No. 652R**) was collected, the analysis of which will be found in Chapter XI in the description of the **Gates & Bailey Quarry.** In **Beverly District** this limestone is 55 feet thick at the Faulkner Quarry of the **Monongahela Construction Company,** as will be described in Chapter XI. In **Huttonsville District** it is 60 feet thick, dark, weathering yellow, and siliceous, as exposed along the Staunton and Parkersburg Pike on the western side of Cheat Mountain, and as recorded in the Cromer Top Section. On the same highway in the edge of Pocahontas the Durbin Section records it as 40 feet thick, dark, siliceous and carrying both marine and plant fossils. **Fossil Lots 303 and 304** were collected from the marine fos-

[41] David B. Reger, Pocono Stratigraphy in the Broadtop Basin of Pennsylvania, Bull. Geol. Soc. Am., Vol. 38, pp. 397-410; 1927.

[42] David B. Reger, Mercer-Monroe-Summers Rept., W. Va. Geol. Survey, pp. 462-466; 1926.

sils and are now on file with Dr. Geo. H. Girty at Washington. **Fossil Lot 305** was collected from the plant fossils and is in the hands of Dr. David White at Washington. No report on any of these collections has been received.

In **Mingo District** the Alderson is 40 feet thick on the Point Mountain road at Monterville, as recorded in the Valley Head Section, being dark, shaly, and impure, and carrying abundant marine fossils. Here a collection (**Fossil Lot 377**) by the writer is recorded by Dr. Tilton as containing **Zaphrentis spinulosa, Orthotetes kaskaskiensis, Productus ovatus, Diaphragmus elegans, Echinoconchus alternatus, Spirifer pellaensis, Cliothyridina sublamellosa, Composita trinuclea, Straparollus** sp., and **Psammodus** sp., as will be discussed by him in Chapter XV. At the Snyder Knob Section it is 85 feet thick, dark, weathering yellow, and contains marine fossils (**Spirifer**, etc.). In the Mingo Section it is dark, weathering yellow, 35 feet thick, and carries crinoids (**Pterotocrinus**, etc.) and brachiopods. In the Whitaker Falls Section its top is visible in Elk River at the boat landing just west of Samp. Here, it is locally reported that the top of the limestone between the boat landing and the riffle a few yards farther west carries the tracks of "men and dogs". This portion of the outcrop was covered by a sand bar at the time of the writer's visit but at the riffle there are numerous small water-pits some of which in younger strata might be construed as resembling a three- or four-toed creature. Necessarily they could not be "men and dogs", and presumably they are merely water-pits, although the resemblance to tracks is rather striking.

Farther up Elk River the Alderson is rather well exposed just west of Swacker School where it has a visible thickness of 50 feet and contains a cavern, as previously indicated in a local section under the description of the Webster Springs Sandstone, page 309. The following very interesting exposure is visible in the edge of Pocahontas County in the point between Dry Fork and Douglas Fork:

	Thickness. Feet.	Total. Feet.
1. Top of a gentle knob, peneplain level with a few boulders (3105′ B.)	--	---
2. **Limestone, Reynolds?**, dark, with gastropods and brachiopods, thickness concealed	--	---
3. Shale, green, calcareous	45	45
4. Concealed	60	105
5. **Sandstone, Webster Springs**, greenish-gray, thick-bedded (2955′ B.)	45	150
6. Concealed (2920′ B.)	35	185

	Thickness. Feet.	Total. Feet.
7. **Limestone, Alderson,** dark, weathering yellow, partly shaly and partly hard, mostly sandy and impure	90	275
8. **Limestone, Union,** (mostly **Gasper**), gray, weathering white, hard, oolitic, pure, with crinoids, brachiopods, and cup corals, to drainage (2730′ L.)	100	375

In **Dry Fork District** the Alderson is recorded in the Bickle Knob Section as 40 feet thick, dark to yellow, partly oolitic, and as having brachiopods, crinoids, and cup corals. In the Bowden Section it is 25 feet thick, dark to yellow, impure, partly shaly and partly hard, with a little black chert and with abundant marine fossils. Here **Fossil Lot 372** was collected in the trail west of Taylor Run and according to Dr. Tilton contains **Zaphrentis spinulosa,** crinoid stems, **Stenopora** sp., **Archimedes** sp., **Fenestella** sp., **Orthotetes kaskaskiensis, Productus ovatus, Productus** sp., **Diaphragmus elegans, Spirifer pellaensis, Composita subquadrata, Allorisma clavata,** and **Phillipsia** sp. (pygidium), as further discussed by him in Chapter XV. In the Collett Gap Section it is 40 feet thick, dark-gray to white or yellow, with marine fossils and a little oolite. Here a sample **(No. 700R)** was collected on the land of **E. R. Dyer,** the analysis of which will be found in Chapter XI. In the Evenwood Section it is 60 feet thick, dark to yellow, but split by 10 feet of green and red shale, and containing rather abundant fossils including brachiopods **(Productus, Composita,** etc.), cup corals, and crinoids.

In the Elklick Section it is 110 feet thick and mostly shaly. In the Harman Section it is 35 feet thick, shaly, and contains crinoids and brachiopods. In the Hazelwood Section it is 50 feet thick, dark, and shaly. In the Job Knob Section it is 30 feet thick, and shaly, with crinoids and other marine fossils. In the Haines Knob Section it is 100 feet thick, dark to yellow and shaly, as exposed just above drainage on the west side of Dry Fork at Job. Here it contains brachiopods **(Composita, Spirifer),** crinoids **(Pterotocrinus),** and blastoids **(Archimedes).** At the head of Stinking Run, just at the Pocahontas County line, the following exposure is visible:

	Thickness. Feet.	Total. Feet.
1. **Sandstone, Webster Springs,** makes cliff	10	10
2. Concealed and red shale	30	40
3. **Limestone, Glenray,** greenish-yellow, hard, with crinoids and brachiopods	30	70
4. **Shale, Lillydale,** dark-green, fissile, calcareous, with abundant marine fossils,		

	Thickness. Feet.	Total. Feet.
crinoids, brachiopods (**Orthotetes, Productus inflatus, Spirifer pellaensis**); makes summit of gap (3170′ B.)	30	100
5. **Limestone, Alderson**, dark, weathering yellow, shaly, with abundant fossils, crinoids, brachiopods (**Spirifer pellaensis, Composita, Productus ovatus, Productus inflatus**), gastropods, cup corals	35	135
6. Shale and flaggy sandstone, green, slightly calcareous	20	155

On the west side of Dry Fork opposite the mouth of Gandy Creek the top of the Alderson Limestone is visible at elevation 2740′ B., there being 50 feet exposed above drainage. Here it is dark to yellow and contains brachiopods (**Spirifer pellaensis, Composita, Productus**), and cup corals. On the west side of Dry Fork just above Mullenax Run it is again visible, its top being at elevation 2855′ B., and crinoids, brachiopods, and cup corals being noticeable on its surface. On the west side of Dry Fork just northwest of the private road which turns westward 5½ miles above the junction of Dry Fork with Gandy Creek it is visible at elevation 3300′ B., with a thickness of 55 feet, on the land of **Osceola Dyer**, as will be later exhibited in Chapter XI.

In Chapter XI the chemical qualities of the Alderson Limestone and its possible economic uses will be discussed under the subject of "Limestone".

Cypress Sandstone (Greenville Shale).

The **Cypress Sandstone** of Englemann[43], described by Butts[44] as occupying the interval between the Golconda Formation and Gasper Limestone in eastern Kentucky, can now be safely correlated in Randolph County. It has already been stated that the Alderson Limestone of West Virginia is correlative with the Glen Dean and Golconda of the Mississippi Valley States, the statement having been established by its fauna and by direct tracing from West Virginia southwestward to Kentucky. It is also certain beyond serious question that the upper part of the Union Limestone of West Virginia correlates with the Gasper Limestone of Kentucky and hence it follows that the sandstone lying between the Alderson and Union Limestones is in the stratigraphic position of the Cypress and may be given that title. In Monroe

[43]Henry Englemann, Report on Hardin County, Illinois Geol. Survey, Vol. 1, p. 356; 1855.

[44]Chas. Butts, Mississippian Series of Eastern Kentucky, Kentucky Geol. Survey, Ser. VI, Vol. VII, pp. 165-169; 1922.

and certain other southern counties of West Virginia this interval is not occupied by sandstone but by a black fissile shale, named the Greenville Shale by Reger[45]. In Monroe County there is no sandstone either above or below the shale and in Randolph County there is no shale either above or below the sandstone and hence it does seem possible to arrange the two in proper stratigraphic sequence. It appears more probable that they are of the same age and that their difference is due to a variance of sedimentation. Until further information is secured, therefore, it seems appropriate to call it "Cypress" in regions where it is a sandstone, and "Greenville" where it consists entirely of shale.

As it occurs in Randolph County the Cypress Sandstone is green or red, shaly, calcareous, and lenticular, with a thickness which is sometimes 50 or 60 feet but more often less than 10 feet, and so far as observed barren of marine fossils. In **Beverly District** it is visible in the Faulkner Quarry of the **Monongahela Construction Company**, as will be later detailed in Chapter XI. Here it is 12 feet thick, consisting of calcareous sandstone and red shale. In **Huttonsville District** it is exposed on the western slope of Cheat Mountain along the Staunton and Parkersburg Pike, being 15 feet thick, red, and calcareous with some red shale, as exhibited in the Cromer Top Section. On the same highway it is visible on the eastern side of Back Allegheny Mountain where it is 10 feet thick, red, and flaggy, as noted in the Durbin Section. In **Mingo District** the Mingo Section notes it as five feet thick and shaly.

In **Dry Fork District** it is recorded in the Bickle Knob Section where it is 10 feet thick, dark, shaly, and calcareous. In the Laneville Section it is 45 feet thick but its character is not recorded. In the Harman Section it is 55 feet thick, and calcareous. In the Hazelwood Section it is 10 feet thick, green, and thick-bedded.

It is not apparent that the Cypress Sandstone will serve any known economic purpose. On the other hand it is rather to be considered as a highly objectionable waste material which must often be removed at a dead loss when the limestone ledges of the Greenbrier above and below it are being quarried.

Union Limestone.

The **Union Limestone** of Reger[46], coming next under the Cypress Sandstone in Randolph County, is the backbone of

[45]David B. Reger, Mercer-Monroe-Summers Rept., W. Va. Geol. Survey, pp. 466-7; 1926.

[46]Ibid., pp. 467-472.

the Greenbrier Series, not only in West Virginia but also in other Appalachian States wherever the calcareous portions of the Mississippian rock column are found and by whatever name they may be called. In Monroe County, where this member was named, and in certain adjacent counties, it consists of one huge bed of homogeneously pure gray limestone which almost invariably weathers to a white color and which is incapable of subdivision except by laborious paleontologic studies; and the same condition prevails in a considerable part of the adjacent portion of southwestern Virginia. Westward from Virginia, however, in Kentucky, Illinois, and other States of the Mississippi Valley, the same formation is separated into several benches by beds of sandstone. Of these sandstone beds the Bethel Sandstone of Butts[47] has been traced by him not only through western Kentucky but as far south as Alabama and appears to be the chief factor that separates the Gasper above from the Ste. Genevieve (Fredonia) below. In northern West Virginia also, a widely persistent sandstone bed appears immediately below the Gasper portion of the Union Limestone and continues northward and northeastward into Pennsylvania as far as the Union or its correlatives can be traced. In his earlier studies of the Mississippian the writer was inclined to think that this northern sandstone might represent the Rosiclare of Illinois which there separates the Ste. Genevieve into two benches concerning which the titles have been in dispute but on which Butts, in his Western Kentucky Report, recognizes the O'Hara Limestone as the upper division and the Fredonia Limestone as the lower division. Passing eastward through Kentucky the same author indicates the disappearance of the Rosiclare and O'Hara members, leaving the Fredonia as the sole representative of the Ste. Genevieve.

In West Virginia the evidence may not be absolute but it is at least strongly indicative that the lower portion of the Union Limestone is of Fredonia age. In the southern part of the State it contains Platycrinus penicillus (huntsvillae) and other Fredonia fossils and northward it may be traced almost by sight until it enters Pennsylvania. In Randolph County, therefore, the writer considers the proper descending succession of the Union Limestone to be as follows:

Gasper Limestone Portion.
Bethel Sandstone Portion.
Fredonia Limestone Portion.

The Gasper portion in this county is gray, dark-gray, or

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[47] Chas. Butts, Mississippian Formations of Western Kentucky, Kentucky Geol. Survey, pp. 63-64; 1918.

dove-colored, weathering white, usually pure, and generally oolitic, hard and often crystalline, with a variable thickness which is frequently 40 to 60 feet. It contains marine fossils among which are brachiopods (**Productus**, **Orthotetes**, etc.), crinoids, cup corals, blastoids (**Pentremites**), trilobites, and fish teeth. The **Bethel Sandstone** portion is usually red, shaly, and calcareous, with streaks of red shale and occasional streaks of limestone which may or may not contain marine fossils, and with a thickness which usually varies from 10 to 20 feet but which in some cases is considerably expanded by beds of shale. The **Fredonia** portion is gray, dark-gray, or dove-colored, weathering white, usually hard, siliceous, and cross-bedded, oolitic, with occasional beds of red shale or shaly sandstone, often pure and crystalline, and usually 50 to 75 feet thick. It contains marine fossils which are generally fragmentary and hard to collect, including brachiopods, small gastropods, crinoids, cup corals, blastoids (**Pentremites**), and others; and at one locality it carries small silicified stems of trees. One of its distinguishing physical features is its cross-bedded structure, as well illustrated in Plate XLIV. This structure, which is unusual in limestones, is an almost constant feature throughout the northern part of West Virginia and the adjacent part of Pennsylvania; and in the Mississippi Valley it has been noted in beds of the same age by many geologists. As a general rule the most conspicuously cross-bedded localities exhibit rather abundant, microscopic grains of silica, evidently carried into the original calcareous ooze by the storms which disturbed the bedding.

In **New Interest District** the Union Limestone has been quarried on Saltlick and Schoolcraft Runs in Laurel Ridge west of Montrose at the **Robert Johnson** and **Lewis Harris Quarries**, as will be later described in Chapter XI. In **Leadsville District** it is quite well exposed at the **Gates and Bailey Quarry** at Aggregates, as exhibited in the Aggregates Section, pages 150-1, and as will be discussed in Chapter XI. Here its total thickness is 181 feet, including 70 feet of Gasper, 26 feet of Bethel, and 85 feet of Fredonia. **Fossil Lot 349**, collected near the middle of the Gasper portion, contained a shark tooth of the genus **Petalodus**, as identified by Dr. Tilton whose comment appears in Chapter XV. **Fossil Lot 463**, near the base of the Fredonia portion, collected by the writer and Dr. B. L. Miller, of Lehigh University, consists of the silicified casts of small trees, three or four inches in diameter, as discussed by Dr. Tilton in Chapter XV.

In **Beverly District** it is 95 feet thick along the Staunton and Parkersburg Pike on Rich Mountain, consisting of 60 feet of Gasper, 10 feet of Bethel, and 25 feet of Fredonia, as recorded in the Beverly Section and as will be discussed in the description of the **Grace Hart Johnson Quarry** in Chapter XI. In the Elkhorn School Section it is 205 feet thick, with 100 feet of Gasper, 30 feet of Bethel, and 75 feet of Fredonia, which latter was sampled on the land of **Richard Wamsley** and will be discussed in Chapter XI. On the same slope of Cheat Mountain it was sampled on the land of **G. W. Daniels,** as will be discussed in Chapter XI. On Shavers Fork it is well exhibited at the **Monongahela Construction Company Quarry** at Faulkner, the **Elkins City Lime Quarry** at Bowden, the **Standard Lime and Stone Company Quarry,** and the **Leadsville District Quarry** both east of Bowden.

In **Huttonsville District** the Union is only 40 feet thick along the Staunton and Parkersburg Pike on the western slope of Cheat Mountain, as noted in the Cromer Top Section. On the same highway on the eastern slope of Back Allegheny it is 110 feet thick, as shown in the Durbin Section, with 73 feet of Gasper, two feet of Bethel, and 35 feet of Fredonia. On the eastern side of Mill Creek, 3.5 miles southeast of Mill Creek town, there is a visible exposure of 20 feet of gray, oolitic Gasper at elevation 2290′ B. Near the same locality the Fredonia is exposed and was sampled, as will be discussed in the **John F. Nydegger Exposure** in Chapter XI.

In **Mingo District** the Snyder Knob Section records 80 feet of Gasper and 65 feet of Fredonia, the former of which was sampled at the **Woodford Hutton Exposure,** as will be discussed in Chapter XI. On the head of Logan Run the visible portion of the Fredonia is 75 feet thick, as will be detailed in connection with the description of the Warsaw Limestone on a subsequent page. In the Mingo Section the Gasper is 25 feet thick and the Fredonia 25 feet, the latter having been sampled as described in the **F. P. Marshall Heirs Exposure** in Chapter XI. In the same chapter will be found a description of the **G. N. Wilson Exposure** on the head of Elkwater Fork and the **George W. Fretwell Exposure** in the big sink at Monterville. In the Valley Head Section the Gasper is 65 feet, the Bethel 20 feet, and the Fredonia 40 feet. On Elk River 1.3 miles south of Valley Fork the Gasper portion was sampled on the land of **West Virginia Pulp & Paper Company,** as discussed in Chapter XI, and on the north side of the same river 0.3 mile north of the Pocahontas County line the visible Gasper is 50 feet thick at elevation 2490′ B. In the edge of Pocahontas a local measurement at the junction of Dry Fork and Douglas Fork, published under the description of the Alderson Limestone, page 326, shows 100 feet of visible Union Limestone, mostly Gasper, just above drainage.

In **Dry Fork District** the Union is recorded as 180 feet thick in the Bickle Knob Section, with 65 feet of Gasper, 20 feet of Bethel, and 95 feet of Fredonia. In the Bowden Section the total exposure of Union is only 25 feet of which the Gasper is 15 feet and the Bethel four feet, only six feet of the upper part of the Fredonia being visible. In the Collett Gap Section the total Union is 162 feet, with 27 feet of Gasper, 27 feet of Bethel, and 108 feet of Fredonia. The Gasper and Fredonia were sampled on the land of **E. R. Dyer**, as will be discussed in Chapter XI. In the Evenwood Section the Union is 137 feet thick, as exposed in the road at Alpena, but contains several beds of shale, the Gasper being 15 feet, the Bethel 50 feet, and the Fredonia 72 feet.

On the west side of West Fork of Glady Fork just south of Glady Station the Gasper was examined and sampled on the land of the **Globe Realty Company**, as will be detailed in Chapter XI. On the same side of this fork of Glady 2.2 miles south of Glady Station the Gasper is visible just above the railroad track at elevation 2995′ B., with a thickness of 50 feet. At the Elklick Section on Dry Fork the total Union is 175 feet, with 20 feet of Gasper, 50 feet of Bethel, and 105 feet of Fredonia, the latter having benches of red shale. In the Laneville Section the total Union is 210 feet. In the Harman Section it is 250 feet, with 75 feet of Gasper, 50 feet of Bethel, and 125 feet of Fredonia. In a ravine east of Dry Fork and 0.4 mile south of Harman the Union is well exposed and was sampled on the land of **Daniel Cooper Heirs**, as will be described in Chapter XI. In the gap of Allegheny Mountain at the head of Horsecamp Run 1.3 miles southeast of Harperton there is a visible exposure of 30 feet of fossiliferous Fredonia at elevation 3260′ B. In the Hazelwood Section the Gasper is 75 feet and the Bethel 35 feet, the Fredonia being covered. In the Whitmer Section the total Union is 215 feet and was sampled on the land of **Ed Lukens**, as will be described in Chapter XI. In the Osceola Section the total Union is 270 feet thick and was sampled on the land of **Bruce Yokum**, as will be discussed in Chapter XI. On the west side of Dry Fork 5½ miles above Gandy the amount of visible Gasper is 25 feet and was sampled on the land of **Osceola Dyer**, as will be detailed in Chapter XI. The following exposure of the entire Greenbrier and part of the Mauch Chunk is visible in the western slope of Rich Mountain west of Dry Fork at the **William Adamson** farm two miles northwest of Pharis Knob:

			Thickness. Feet.	Total. Feet.
1. Shale, red, not measured			--	---
2. Sandstone, Webster Springs, greenish-brown, thick-bedded, hard (3680′ B.)			10	10
3. Concealed			35	45
4. Limestone, Glenray, gray, weathering partly white and partly yellow, mostly pure and hard			15	60
5. Concealed			55	115
6. Limestone, Gasper portion, gray, weathering white, pure, oolitic, with crinoids	105′	Union Limestone (3325′ B.)	250	365
7. Concealed, with limestone boulders, Bethel portion	35			
8. Limestone, Fredonia portion, gray, pure, oolitic, with a few crinoids	35			
9. Sandstone, Fredonia portion, red, calcareous	10			
10. Limestone, Fredonia portion, gray, weathering white, pure, oolitic, with crinoids	25			
11. Limestone, Fredonia portion, gray, sandy, poorly exposed	40			
12. Sandstone, Pocono Series			--	---

The economic possibilities of the Union Limestone, together with descriptions of quarries and chemical analyses, will be discussed at some length in Chapter XI under the subject of "Limestone".

Pickaway Limestone.

The **Pickaway Limestone** of Reger[48], coming next under the Union, has almost vanished from the section in Randolph County, its occurrence being confined almost entirely to the southern part of the county. At its type locality in Monroe County this limestone is featured almost universally by a stylolitic structure, if it may be so termed, there being a wavy vertical cleavage in the beds, interfilled with dark siliceous matter. In Randolph this structure still prevails at some localities, and as a rule the stone is dark, hard, and sandy, with a few marine fossils, principally crinoids and brachiopods, and with a thickness ranging up to 50 feet. In **Mingo District** it is exposed on the Point Mountain road south of

[48]David B. Reger, Mercer-Monroe-Summers Rept., W. Va. Geol. Survey, pp. 473-476; 1926.

Monterville and in the big sink north of the road at the same locality, being dark, impure, sandy, stylolitic, and 20 feet thick, as noted in the Valley Head Section. In the Snyder Knob Section it is noted along with the Patton and Sinks Grove but was not divided. In the Mingo Section it is visible along the new State road north of Mace, being dark, weathering yellow, but tinged with pink, mostly stylolitic, and containing a little oolite at the base, with a thickness of 75 feet, and with crinoids and brachiopods. In **Dry Fork District** the Evenwood Section notes its occurrence at Alpena where it is dark, weathering yellow, 15 feet thick, and contains crinoids and cup corals. Its economic possibilities will be discussed in Chapter XI.

Taggard Shales and Limestone.

The **Upper Taggard Shale, Taggard Limestone,** and **Lower Taggard Shale** of Reger[49], coming beneath the Pickaway Limestone in the order named in the southern counties, have almost disappeared in Randolph, the only known exposures being in **Mingo District**. When best exposed in this district the stage consists of an upper shale which is red or green and hardly more than five feet thick; a middle limestone which is grayish-white tinged with red, oolitic, and only about five feet thick; and a lower shale which is red and calcareous and ten feet or less in thickness. In the Valley Head Section these are noted as visible along the Point Mountain road south of Monterville where the Upper Taggard Shale is three feet thick, and red; the Taggard Limestone is three feet thick, red, and oolitic; and the Lower Taggard Shale is five feet thick, red, and calcareous. In the Mingo Section the Upper Taggard Shale is red and green and ten feet thick; the Taggard Limestone is grayish-pink and oolitic, its exposure being too fragmentary for measurement; and the Lower Taggard Shale is red, with some included limestone.

This stage of the Greenbrier appears to be without known economic possibilities but in the more southern counties it is a stratigraphic marker of prime importance.

Patton Limestone.

The **Patton Limestone** of Reger[50], coming next beneath the Taggard stage and being a heavy bed of pure firm limestone in the southern counties, is mostly absent from Randolph County, its known exposures being confined to the southern portion. When present it is dark-gray, tinged with

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[49]Ibid., pp. 476-480.
[50]Ibid., pp. 480-483.

red, hard, and somewhat siliceous, slightly oolitic, and at a few exposures stylolitic at the top, with a thickness ranging up to 50 feet, and with only a scant marine fauna. In **Mingo District** the Valley Head Section records it on the land of **George W. Fretwell** near Monterville where it was sampled as will be discussed in Chapter XI. In the Mingo Section it was noted along the State road north of Mace and was sampled on the land of **F. P. Marshall Heirs**, as will be described in Chapter XI. In **Dry Fork District** the Evenwood Section records its occurrence at Alpena where it is 16 feet thick, partly dove-colored and partly yellow and sandy. Its economic possibilities will be discussed in Chapter XI.

Patton Shale.

The **Patton Shale** of Reger[51], coming next under the Patton Limestone, and at its type locality in Monroe County containing numerous marine fossils and also a fairly well preserved plant flora, is almost entirely absent in Randolph County, its only known exposures being in **Mingo District.** In the Valley Head Section it is represented by a greenish-brown, flaggy sandstone, five feet thick, as exposed in the big sink south of Monterville. In the Mingo Section it is two feet thick, and red. It is only a stratigraphic marker with little or no economic significance.

Sinks Grove Limestone.

The **Sinks Grove Limestone** of Reger[52], coming next beneath the Patton Shale, is the oldest known formation of the Greenbrier in Randolph County, there being no recognized exposure of the Hillsdale (St. Louis) north of Pocahontas County. The Sinks Grove itself was observed only in **Mingo District.** Here it is dark, weathering yellow, hard, amorphous, impure, slightly oolitic, with a thickness ranging up to 50 feet, and with marine fossils, including brachiopods **(Orthotetes, Productus, Spirifer)**, and fenestelloids. In the Valley Head Section it is 20 feet thick, mostly dark and siliceous. In the Mingo Section it is exposed in the old road just south of the church between Mingo and Mace where it is 70 feet thick, gray, hard, and oolitic at the top; impure and sandy at the middle; and dark to yellow and amorphous in the lower part with marine fossils as above listed. Here it was sampled on the land of **F. P. Marshall Heirs** as will be discussed in Chapter XI.

[51]Ibid., pp. 483-4.
[52]Ibid., pp. 484-487.

ECONOMIC ASPECTS, GREENBRIER SERIES.

The Greenbrier Series, on account of its abundant limestones, is of prime importance in Randolph County and for that reason has been studied with great care. Its outcrops at many localities have weathered into rich soil, supporting a very considerable part of the sheep and cattle grazing industry on which the county began its existence and which should apparently continue for an indefinite period. This same soil, in many localities, supports good agricultural crops but often the outcrops are so high above sea-level that quickly maturing seed must be planted in order to avoid destruction by frost. The hard members of the series afford an inexhaustible supply of road material, railroad ballast, and aggregate, which has already been put to extensive use both within and without the county. Certain portions of the Union Limestone have been ground or burned for agricultural lime and would be suitable for Portland cement. The economic features of the series will be further discussed in Chapter XI under the subject of "Limestone".

MACCRADY SERIES.

GENERAL ACCOUNT, MACCRADY SERIES.

The **Maccrady Series**, having its type locality in southwestern Virginia and having first been described as the "Pulaski Shale" by Campbell[53] and later changed to "Maccrady Formation" by Stose[54] to rectify a preemption of the title "Pulaski", and herein, as in former West Virginia Reports, designated as a series in harmony with the description of other major subdivisions, occurs between the Greenbrier and Pocono Series and partly bridges the known unconformity between them. In southwestern Virginia it is described as 700 feet or more in thickness at some localities but in West Virginia its known maximum is seldom in excess of 350 feet and it thins rapidly northward so that in Randolph County it seldom, if ever, exceeds 50 feet, and in most of the county is entirely absent. Figures 4 and 5 show its position in the general stratigraphic column. It consists partly of yellow and impure limestone followed below by red, purple, or yellow shale with some included sandy streaks.

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[53] M. R. Campbell, Bull. Geol. Soc. Am., Vol. V, pp. 171, 178; 1894.

[54] Geo. W. Stose, Geology of the Salt and Gypsum Deposits of Southwestern Virginia, Bull. 530, U. S. Geol. Survey, pp. 232-255; 1913.

PLATE XXXI.—View of Pharis Knob, looking northwest across Gandy Creek. Top and upper slope of knob are Mauch Chunk followed below by Greenbrier shelf with a low ridge of Pocono at left middle. Immediate foreground is Catskill. (Photo. by U. S. Forest Service.)

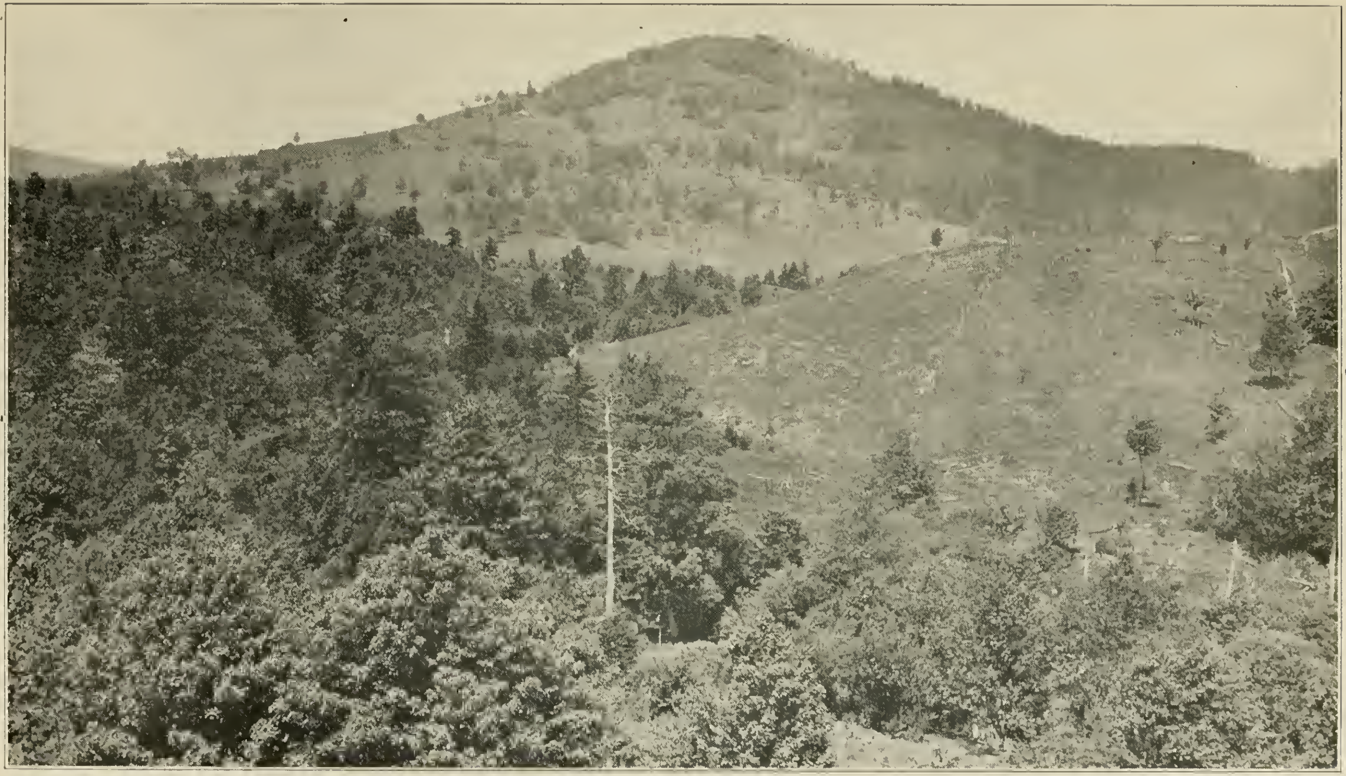

PLATE XXXII.—View of Yokum Knob near Osceola looking westward across Gandy Creek. Top of knob is Mauch Chunk followed below by Greenbrier with Pocono in ridge at middle right. (Photo. by U. S. Forest Service.)

PLATE XXXIII.—Upper end of the **Gandy Creek sink near** Osceola, looking north, with Yokum Knob in left background. Floor of sink is Pocono followed above by Greenbrier bluffs and slopes with Mauch Chunk capping knob.
(Photo. by U. S. Forest Service.)

PLATE XXXIV.—A close view of Gandy Creek sink showing erosion through Fredonia portion of Union Limestone of Greenbrier Series. (Photo. by U. S. Forest Service.)

SUBDIVISIONS, MACCRADY SERIES.

No subdivision of the Maccrady into members has been made in the region of its greatest thickness and most varied lithology in Virginia and none has been thought advisable in West Virginia where it has lost many of its distinguishing differences. In Virginia, however, it has been separated into two portions, as will be later discussed. In Randolph it exhibits the same aspect, with the limestone at the top followed by the shales at the base.

TOPOGRAPHIC EXPRESSION, MACCRADY SERIES.

When present the Maccrady is found on the Pocono-Greenbrier topographic shelf of which it is then a constituent part. Its strata are quite incompetent and would rapidly erode into ravines or valleys but they are so thin and lie so nearly horizontal in Randolph that no appreciable topographic effect is visible.

AREAL EXTENT, MACCRADY SERIES.

Figure 10 shows at a glance the combined outcrop of Maccrady and Pocono and on Map II the separate areal extent of each is delineated. The known outcrops, except for certain outliers, are confined entirely to the extreme southern end of Tygart Valley in Mingo District.

CONTACTS, MACCRADY SERIES.

The upper contact of the Maccrady with the Greenbrier Series has already been discussed in connection with the latter series. In the region of Maccrady outcrop the lowest member of the Greenbrier is generally the Sinks Grove Limestone, and there is evident unconformity. At its base the Maccrady rests on the Pocono Series which latter in Randolph County seldom exhibits a full stratigraphic section due to erosion or non-deposition. It is therefore apparent that unconformity also exists at this stage.

FOSSIL LIFE, MACCRADY SERIES.

At its type region in Virginia the calcareous portions of the Maccrady are richly fossiliferous and in southern West Virginia some of these marine fossils may still be found. In Randolph County they were not observed, although an exhaustive search was not made.

CORRELATION, MACCRADY SERIES.

A satisfactory correlation of the Maccrady with the for-

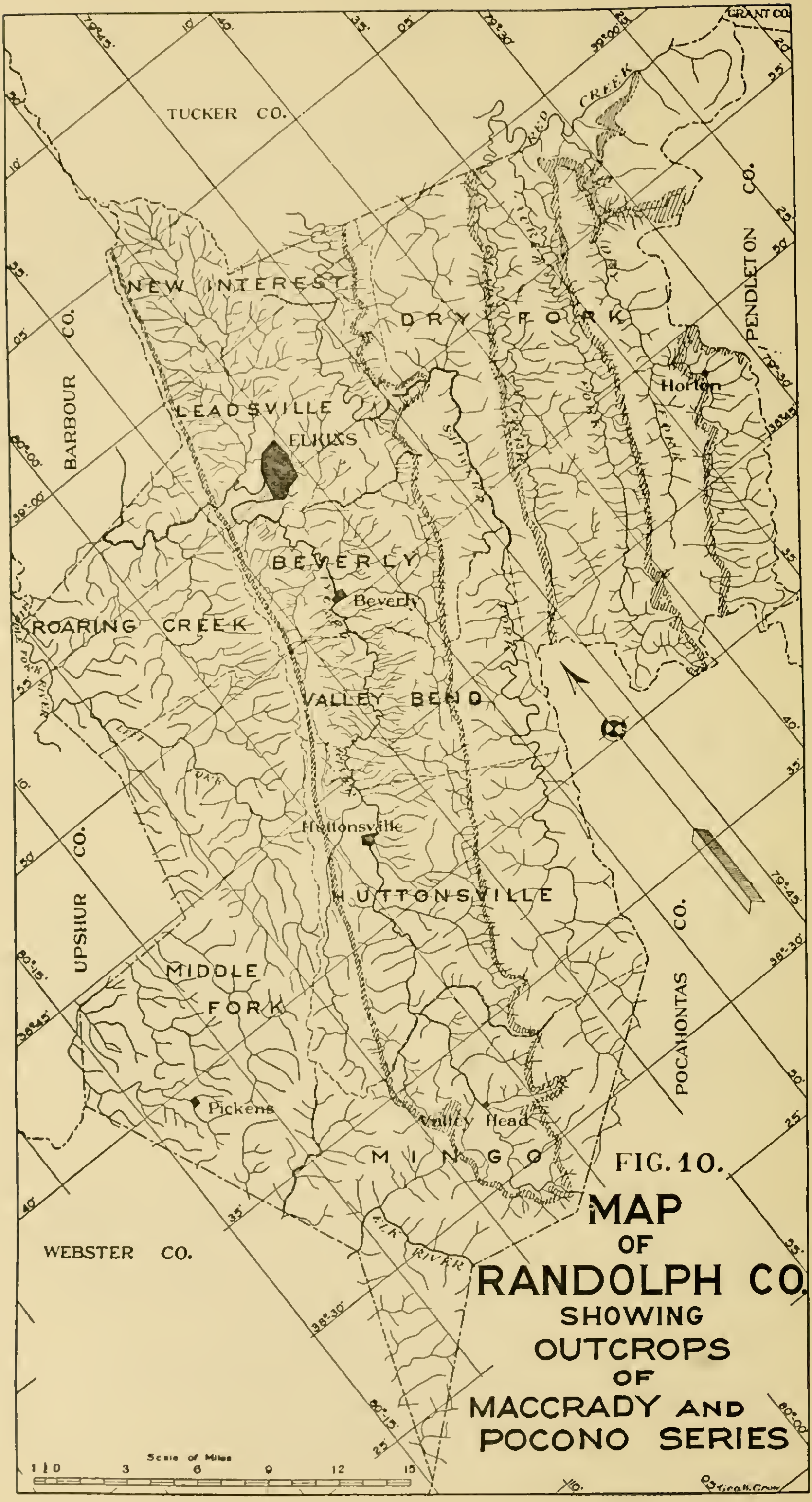

FIG. 10.

MAP OF RANDOLPH CO. SHOWING OUTCROPS OF MACCRADY AND POCONO SERIES mations of other States has not been reached. Girty[55], in a brief statement discussing its fauna, says:

"I would hesitate to assign any geologic age to this fauna definitely, though it impresses me (upon very unsubstantial evidence, I confess) as more probably Warsaw."

Butts[56] puts the calcareous portion into the Warsaw in certain recent work in Virginia and correlates the red shale portion with the New Providence. Price[57] follows his lead with reference to the limestone in Pocahontas County, basing his opinion mainly on the numerous geodes which are described in the Warsaw of Iowa and which he finds in Pocahontas County. The writer, in an attempt to get additional light on the problem, has made a considerable collection of Maccrady fossils at Saltville, Smyth County, Virginia, near the type locality of the Maccrady, but these fossils are still unpacked. For the sake of uniformity the Warsaw usage for the limestone will be followed herein, without commitment of opinion.

DESCRIPTION OF MEMBERS, MACCRADY SERIES.

In **Middle Fork District** the **John J. Betler No. 1 Well (14)**, the record of which will be published in Chapter IX, notes eight feet of red shale at the base of the Greenbrier. This would correspond to the Maccrady. In **Beverly District** the exposure at the Elkins Lime Quarry south of the railroad at Bowden, the section of which will be published in Chapter XI, shows seven feet of yellow, siliceous, and oolitic limestone beneath the Greenbrier, followed by five feet of yellow shale and yellow sandstone next to the Pocono. The upper part may be Warsaw. In **Mingo District** on the road between Mingo and Ralston Run the Maccrady consists of 35 feet of red shale at the base followed above by 10 feet of concealed beds which might hold the Warsaw. Along the old road through the Mingo Flats, between Upper Mingo and Mace the Maccrady is exposed at several points, consisting of five feet of yellow and impure Warsaw Limestone at the top and ten feet of yellow soil below it next to the Pocono, as recorded in the Mingo Section. In the Snyder Knob Section there is a 20-foot stratum of impure, yellow limestone beneath the Greenbrier which may be Warsaw. On the ridge at the head

[55]Geo. H. Girty, Observations on the Faunas of the Greenbrier Limestone and Adjacent Rocks, Tucker Rept., W. Va. Geol. Survey, p. 483; 1923.

[56]Chas. Butts, Oil and Gas Possibilities at Early Grove, Scott County, Virginia, Virginia Geol. Survey, Bull. 27, pp. 3-8; 1927.

[57]Paul H. Price, Pocahontas Rept., W. Va. Geol. Survey, pp. 188-9; 1929.

of Logan Run two miles southeast of Valley Head the following local measurement at Wares Ridge School indicates the connection of the Maccrady with the overlying Greenbrier and the underlying Pocono:

	Thickness. Feet.	Total. Feet.
Greenbrier Series (75'+)		
1. Limestone, Union, (Fredonia portion), gray, hard, pure, mostly oolitic, with a few fossil fragments (3135' B.)	75	75
Maccrady Series (20')		
2. Limestone, Warsaw, shaly and impure, with a little black chert and worn sandstone gravels coated with manganese at base	20	95
Pocono Series (120'+)		
3. Shale, gray, tinged with red, sandy	20	115
4. Sandstone, Broad Ford, greenish-brown, thick-bedded; poorly exposed but represented by abundant boulders many of which have white, elongated, and flattened quartz pebbles and others of which have abundant marine fossils, including Syringothyris, Spirifer?, Orthotetes, crinoids, etc., about	100	215

In the Durbin Section the Maccrady is 80 feet thick with ten feet of red limestone at the top and 70 feet of red and yellow shale at the bottom. In Dry Fork District the following exposure was observed along the road which skirts the eastern base of Shavers Mountain 1.9 miles north of Wheeler:

	Feet.
1. Limestone, gray, massive, Fredonia portion of Union Limestone	--
2. Limestone, Warsaw, dark, weathering yellow	15
3. Shale and sandstone, yellowish-green, calcareous	10
4. Shale, red	10
5. Concealed, to top of Pocono	10

It is believed that Nos. 2-5, inclusive, of the above exposure represent the Maccrady.

On the north side of Shavers Fork at the highway bridge just east of Bowden a bed of yellow, shaly limestone, ten feet thick, between the Greenbrier and Pocono is probably Warsaw. In the Osceola Section the red shale of the Maccrady is 15 feet thick along the road between the old village and the Gandy sink.

ECONOMIC ASPECTS, MACCRADY SERIES.

The principal and only function of the Maccrady sediments of the county, as now evident, is to make agricultural soil. Both the limestone and the shale weather into a fairly rich loam.

POCONO SERIES.

GENERAL ACCOUNT AND SECTION, POCONO SERIES.

The Pocono Series comes next below the Maccrady when the latter is present but on account of unconformity is more apt to be found immediately beneath the Greenbrier in most of Randolph County. It is the oldest major subdivision of the Mississippian found in West Virginia.

Figures 4 and 5 show its position in the general stratigraphic column. When present it usually varies from 25 to 225 feet in thickness and consists almost entirely of arenaceous and argillaceous material without limestone and with only traces of coal. Its sandstones are gray, greenish-gray, or reddish-brown, usually coarse, cross-bedded, and often conglomeratic with elongated and flattened white quartz pebbles, but frequently fine-grained or shaly. In some localities the upper ledges are impregnated with considerable iron oxide which colors them reddish-brown and there is some slight segregation into nodules. The shales are sometimes gray or brown and sandy and more rarely dark and carbonaceous. The following general section represents the series as it occurs in certain parts of the county, the four upper members being totally absent at the known outcrops but possibly present in part farther west as indicated by gas well borings next to Upshur and Barbour Counties:

General Section of the Pocono Series of Randolph County.

	Thickness. Feet.	Total. Feet.
1. Sandstone, Logan (Burgoon), (Big Injun Oil Sand), gray and coarse in some regions, but not observed at outcrop in Randolph County	--	---
2. Shale, sandy, not observed at outcrop	--	---
3. Sandstone, (Squaw Oil Sand), not observed at outcrop	--	---
4. Shale, sandy, representing position of Merrimac Coal, Lindside Sandstone, and Langhorne Coal of southern West Virginia and Virginia; not observed at outcrop	--	---
5. Sandstone, Broad Ford (Weir Oil Sand of Kanawha County is apparently part of this horizon), reddish-brown, greenish-gray, rusty, and ferruginous, or sometimes light-gray, usually thick-bedded and frequently hard, but often shaly and weathering to concretionary or chunky blocks; often carries beds of white quartz pebble conglomerate; usually contains one or more zones of marine fossils, brachiopods (Syringothyris, Spirifer,		

	Thickness. Feet.	Total. Feet.
Orthotetes, Chonetes, Camarotoechia), pelecypods, gastropods, crinoids, cephalopods (Orthoceras), etc. (see Lots 352, 353, and 371); also carries a few plant remains and the fucoid? or worm boring? Taonurus caudi-galli; most persistent member of series in Randolph County, being generally present in regions where there is Pocono	25 to 150	150
6. Shale, Sunbury (Coffee Shale of West Virginia oil fields), black, fissile, and carbonaceous, or greenish-gray and sandy; contains a few marine or brackish-water fossils, Lingula, ostracods, and other small bivalves, and fish teeth; generally carries plant fossils; present in southern and eastern portions of county	0 to 40	190
7. Sandstone, Berea, gray, or greenish-gray, massive, coarse, and hard, with occasional beds of shale which contain plant fossils; present at some localities in southern and eastern parts of county	0 to 35	225
Catskill Series (Devonian), red and green shales, etc.	--	---

SUBDIVISIONS, POCONO SERIES.

In the Potomac River region of eastern West Virginia and central Maryland the Pocono Series has been divided into major groups by Stose and Swartz[58] in the following descending order:

Pinkerton Sandstone
Myers Shale
Hedges Shale
Purslane Sandstone
Rockwell Formation.

The above divisions are easily recognizable in the region where they have been made and may be traced northeastward in Maryland and Pennsylvania for a considerable distance. Southwestward in West Virginia and Virginia they have not been successfully traced, as the distinctively red Myers Shale disappears and as no marine fossils have been found in the Potomac region in any of these subdivisions. In Randolph County the Pocono has little resemblance to the Potomac section and hence the subdivisions of that region can not be employed. On the contrary it may be correlated to a considerable extent with the known formations in States to the southwest and west and with those in southern Pennsylvania, and

[58]George W. Stose and Charles K. Swartz, Pawpaw-Hancock Folio, No. 179, U. S. Geol. Survey; 1912.

hence it is safe to use the member names which have acquired usage in the regions named.

TOPOGRAPHIC EXPRESSION, POCONO SERIES.

The Pocono outcrops of the county almost invariably occur along the middle and lower slopes of mountains adjacent to anticlinal valleys. In such position and in connection with the Greenbrier which is usually superjacent, there is nearly always a wide topographic shelf, sometimes made by the Pocono alone and sometimes covered with Greenbrier remnants. Often the dip of the rocks toward the mountains is such that small streams may follow the base of the steeper mountain slope and not uncommonly a system of underground drainage has been scoured through the basal Greenbrier and flows on the Pocono floor until a larger transverse stream receives it at some deep hollow. When there is any considerable amount of Pocono the descent toward the softer underlying shales and sandstones of the Catskill Series is often marked by precipitous bluffs or ledges, standing out in bold relief. In certain localities, like the Mingo Flats, the Pocono-Greenbrier shelf includes enough smooth land to support a considerable farming industry.

AREAL EXTENT, POCONO SERIES.

Figure 10, page 338, shows the combine doutcrop of Pocono and Maccrady and on Map II these areas are delineated in more detail. It should be explained, however, that in certain localities the Pocono is locally absent because of unconformity. These local cut-outs were not investigated in sufficient detail to indicate them on the maps.

In **New Interest District** the Pocono outcrop is confined to the eastern slope of Laurel Ridge. In **Leadsville District** it occurs at the southern end of Laurel Ridge, in the gap of Tygart River just east of Aggregates, in the eastern slope of Rich Mountain, and the western slopes of Cheat and McGowan Mountains. In **Beverly District** it outcrops on the eastern slope of Rich Mountain and the western slope of Cheat Mountain. The latter belt curls around the northern end of Pond Lick Mountain and passes under Shavers Fork near Bowden. In **Valley Bend District** the exposures are on the eastern side of Rich Mountain and the western side of Cheat Mountain. In **Huttonsville District** there is an area on the eastern slope of Rich Mountain including part of the valley of Mill Creek, and another on the western slope of Cheat Mountain. In **Mingo District** the outcrop starts at the head of Limekiln Run of Elkwater Fork, passes southward through the hills west of Elkwater Fork and thence near Monterville and Mingo, curling eastward around the head of Tygart River and northward through the foot-hills of Cheat Mountain to the head of Stewart Run. In **Dry Fork District** there is a considerable area on Shavers Fork, starting on the western side of McGowan Mountain, passing around the south side of Bickle Knob and going beneath Shavers Fork at Bowden. Farther east another follows the eastern slope of Shavers Mountain from the Tucker County line southward to Alpena and Glady and to the Pocahontas County line at the head of West Fork of Glady Fork. In Rich Mountain west of Dry Fork the Pocono surrounds the northern end of the mountain, one limb passing southward along the western side to the southern end of the mountain and into Pocahontas County at the Blister Swamp, and the other passing southward along the eastern slope of the mountain and going under drainage on Dry Fork slightly south of Harman. In the Red Creek country a belt starts at the Tucker County line just below Laneville, passes westward to the valley of Dry Fork and thence up the eastern side of that stream until it goes under the river a little south of Harman. East of Whitmer and Horton, there is a short stretch of Pocono in Allegheny Mountain next to the Pendleton County line. Westward this outcrop passes across Gandy Creek below Whitmer and thence southward along the eastern slope of Little Middle Mountain to Osceola and then into Pocahontas County northeast of Blister Swamp.

CONTACTS, POCONO SERIES.

The upper contact of the Pocono with the Maccrady, when the latter is present, or with the Greenbrier when the Maccrady is absent, has already been described. This contact is marked by considerable unconformity because of the absence of the basal Greenbrier, the partial or total absence of the Maccrady, and the general absence of the upper part of the Pocono. At its base the Pocono rests on the Catskill Series of the Devonian and is not marked by angular unconformity but by decided changes in lithology, flora, and fauna. Here the coarse, gray, and often conglomeratic sandstones of the Pocono lie on the red and green shales and reddish-brown, shaly sandstones of the Catskill with easily recognized definition. Here, also, the beautiful Devonian ferns, such as **Archaeopteris** and **Dimeripteris** suddenly end and are succeeded by **Sphenopteris, Triphyllopteris,** and other typical Pocono types. In marine characteristics the change is not so marked, as the Catskill contains only a few species and the lower part of the Pocono is apparently barren.

FOSSIL LIFE, POCONO SERIES.

The floras of the Pocono are not conspicuous in Randolph County but in the shales below some of the sandstones there are fern fragments and frequently the stems of plants are found in the sandstones themselves. The best known locality of the county, which is still far from ideal, is along the old county road at the head of Tygart Valley south of Upper Mingo. Here a rather good Pocono section is visible which was briefly examined by Dr. David White.

Marine fossils are very abundant in the Pocono rocks of the county. These are found principally in the Broad Ford Sandstone member which in turn is the most persistent member of the series. In many localities certain benches of this ledge are mere masses of fossil casts among which are **Syringothyris, Orthotetes, Palaeoneilo,** and various others. **Fossil Lots 352, 353, and 371** were collected by the writer and examined by Dr. Tilton whose identifications appear under the description of this sandstone and whose complete summary is found in Chapter XV. Marine fossils, including **Lingula,** are also found in the Sunbury Shale member but no collection was made. In the Pocono, also, **Taonurus caudigalli,** which is common in the Broad Ford of Virginia and southern West Virginia, was recognized as far north as Bowden.

CORRELATION, POCONO SERIES.

The Pocono derived its name from a mountain in northeastern Pennsylvania where the exposures are poor and where marine fossils, so far as known, do not occur in this series. From this locality, however, it has been traced westward by its unmistakable lithology and its plant fossils to the Broadtop Basin of the Juniata Valley where marine fossils suddenly appear. From this region southwestward it can then be followed by its lithology, flora, and fauna from Pennsylvania into northern West Virginia and thence continuously southwestward across West Virginia and southwestern Virginia into Kentucky and Tennessee, as has now been done by various geologists, including the writer. There can be little doubt that the Price Formation of Virginia is an almost exact equivalent of the Pocono and that the Grainger of Tennessee is almost entirely Pocono, although some slight portions of Devonian may have been mapped with it. In Kentucky the New Providence is tied to the Price and hence to the Pocono by its abundant **Taonurus caudi-galli** and by its various marine faunas. In Ohio the beds of Pocono age have carried various formation names, including Waverly, Cuyahoga, and others, but the relationship is sufficiently plain and conclusive if it be noted that the lower member of the Pocono of West Virginia is the Berea Sandstone of Ohio and its upper member is the Logan of the same State.

DESCRIPTION OF MEMBERS, POCONO SERIES.

Logan Sandstone.

The **Logan Sandstone** of Andrews[59] appears to form the youngest member of the Pocono in West Virginia when the full series is present. This is evidently the same as the **Burgoon Sandstone** of Butts[60]. In West Virginia, as well as portions of Pennsylvania, Ohio, and Kentucky, it is known as the Big Injun Oil Sand, as noted in thousands of well records. In Randolph County there appears to be no exposure of this ledge but in some of the tests for oil and gas in Middle Fork District and the adjacent portion of Upshur County it is noted in the records.

Below the Logan Sandstone, or Big Injun Oil Sand, is the Squaw Sand which appears to have no surface geologic name and which is also absent from the surface exposures of Pocono in Randolph County. Farther down, the section in southern West Virginia contains the **Merrimac Coal, Lindside Sandstone,** and **Langhorne Coal,** all of which are absent by unconformity in the surface beds of Randolph County.

Broad Ford Sandstone.

The **Broad Ford Sandstone** of Reger[61], named from its great exposure near Broad Ford, Smyth County, Virginia, is the upper part of the exposed Pocono of Randolph County and is also the most persistent member of the series, being present at many localities where no vestige of any other member remains. The Weir Oil Sand of Kanawha County is apparently part of this sandstone. The Broad Ford in Randolph is mostly reddish-brown in color but may be greenish-gray or light-gray. It is usually thick-bedded and frequently hard, but often shaly and weathering to concretionary or chunky blocks; and it sometimes carries beds of white quartz pebble conglomerate, the pebbles being flattened and elongated by sliding friction. It nearly always carries one or more thin zones of marine fossils, including brachiopods

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[59]E. B. Andrews, Report of Progress, 1869, pp. 62, 76; Ohio Geol. Survey; 1870.

[60]Chas. Butts, Kittanning Folio, No. 115 (1904), and Ebensburg Folio, No. 133 (1905); U. S. Geol. Survey.

[61]David B. Reger, Mercer-Monroe-Summers Rept., W. Va. Geol. Survey, pp. 520-525; 1926.

(Syringothyris, Spirifer, Orthotetes, Chonetes, Camarotoechia), pelecypods, gastropods, crinoids, and cephalopods. It also has a few plant remains and the fucoid? or worm boring? Taonurus caudi-galli which is not abundant in the county but which has been noted as far north as Bowden. The ledge varies from 25 to 150 feet in thickness.

In New Interest District a fossiliferous zone near the middle of the Broad Ford is exposed along the county road north of Saltlick Run of Leading Creek 2.3 miles west of Montrose at elevation 2305′ B. Fossil Lot 353 was collected at this point from which Dr. Tilton reports crinoid stems, Orthotetes kaskaskiensis, Syringothyris textus?, Palaeoneilo concentrica, pelecypod, Pleurotomaria?, Platyceras sp., gastropod (medium spire), and Orthoceras sp.

In Leadsville District it is noted in the Morgantown Pike Section, pages 153-4, where it is 81 feet thick and contains marine fossils. Fossil Lot 352 was collected at this exposure and according to Tilton contains crinoid stems, pelecypod, gastropod (medium spire), Syringothyris textus, Palaeoneilo sp., Platyceras sp., and Orthoceras sp., as discussed by him in Chapter XV. In the Aggregates Section its outcrop is poorly exposed but it is about 48 feet thick, partly gray and pebbly but mostly reddish-brown and ferruginous.

In Huttonsville District it is exposed along the Staunton and Parkersburg Pike on the western side of Cheat Mountain, as noted in the Cromer Top Section, being 40 feet thick, gray, and pebbly, and comprising the entire Pocono at that locality. In Mingo District the Valley Head Section records it as 50 feet thick, partly greenish-gray and partly reddish-brown, with numerous pebbles and with abundant marine fossils, including Spirifer? or Syringothyris? and Orthotetes. In the Snyder Knob Section it is 120 feet thick, greenish-brown, thick-bedded, pebbly, and fossiliferous. In the Mingo Section it is 160 feet, but broken into benches by shale, with one zone of fossils near the top, another near the middle, and still another near the base. On the road from Mingo to Ralston Run, 0.7 mile northwest of Mingo, it has a visible thickness of 55 feet at elevation 2830′ B., and contains marine fossils, including Syringothyris?. At a local measurement near Wares Ridge School on the head of Logan Run two miles southeast of Valley Head, as included in a discussion of the Maccrady Series, page 340, it is about 100 feet thick and contains numerous fossils.

In Dry Fork District the Broad Ford Sandstone is 65 feet thick and greenish-gray in the Bickle Knob Section. In the same region it is rather well exposed and quite easily accessible at the following locality:

Local Measurement at Fossil Lot 371.

Dry Fork District; in bluff north of Shavers Fork of Cheat River just west of Bickle Run and 0.2 mile northwest of Bowden; gentle southeast dip; measured with aneroid and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.
Greenbrier Series (40'+)		
1. Limestone, Union, (Fredonia portion), gray, partly pure and oolitic, partly siliceous, visible	30	30
2. Concealed (2285' B.)	10	40
Pocono Series (45')		
3. Sandstone, Broad Ford (2240' B.), greenish-brown, partly conglomeratic with quartz pebbles and partly shaly, with abundant marine fossils and with fucoids (Taonurus caudi-galli). Lot 371; contains plant impressions, crinoid stems, Orthotetes kaskaskiensis, Syringothyris textus, Camarotoechia sp. and Palaeoneilo sp., according to Tilton	45	85
Catskill Series (35'+)		
4. Shale, red, green and variegated	10	95
5. Concealed to Shavers Fork (2205' B.)	25	120

Dr. Tilton's further comment on the above locality will be found in Chapter XV. It should also be noted that the identification of Taonurus caudi-galli was made in the field by the writer from fragile specimens which were not collected.

In the Evenwood Section the Broad Ford is 60 feet thick, greenish-gray, thick-bedded, and pebbly but so far as noted contained no fossils. In the Elklick Section it is gray, massive, and 25 feet thick. In the Dry Fork Section it is 55 feet, massive, and very ferruginous toward the top. In the Whitmer Section it is 75 feet thick, party reddish-brown, partly greenish-gray, and partly shaly.

The Broad Ford Sandstone in general does not appear fitted to serve any economic purpose at its outcrops in Randolph County. Generally it is too shaly to be used for building stone. What it may hold farther west in the way of natural gas where it goes deeply beneath drainage is less certain.

Sunbury Shale.

The Sunbury Shale of Hicks[62], named from its occurrence near Sunbury, Delaware County, in central Ohio, is a recognized unit of the Pocono in West Virginia and Pennsylvania,

[62]L. E. Hicks, Am. Jour. Sci., 3rd Ser., Vol. XVI, pp. 216, 220; 1878.

being known to the drillers of oil and gas wells in these States as the **Coffee Shale** and used by them as a marker for the Berea Sand which it directly overlies. In the oil fields of West Virginia it has been carefully noted in the records of thousands of wells and by that means has been traced underground from its type locality across the Appalachian Geosyncline to the mountain region of West Virginia where it again outcrops. In the latter region it has now been traced northeastward from Bluefield to the northern part of the State. In the Bluefield country its identification on lithologic and stratigraphic evidence is fairly certain and in addition to that it contains **Lingula melie** and **Linguladiscina herzeri,** as collected by the writer and as identified by Dr. Geo. H. Girty. Its correlation in West Virginia, however, is made on the sole responsibility of the writer, as Dr. Girty says that the fossils are too common to be finally diagnostic. In a former Report the writer[63] has discussed this matter at some length and has pointed out the fact that the guide fossils of the Sunbury are **Lingula melie** and **Orbiculoidea herzeri,** the latter being generally regarded as the equivalent of **Linguladiscina herzeri.** Both of these guide fossils have been traced by Butts and others through the Sunbury Shale of Kentucky and the writer has found them where they might be expected in Tazewell County, Virginia, and in Mercer County, West Virginia. More recently Price[64] has found them in the same shale in Pocahontas County.

In Randolph County the Sunbury is black, fissile, and carbonaceous, or greenish-gray and sandy, with a thickness ranging up to 40 feet, and with a few marine or brackish-water fossils, including **Lingula,** ostracods, and other small bivalves, and fish teeth, and with the remains of fossil plants. Its occurrence at outcrop is confined mostly to the southern and eastern parts of the county. In **Mingo District** it is exposed along the old county road south of Upper Mingo, as recorded in the Mingo Section, page 179, where it is 30 feet thick at elevation 2845′ B., being black and fissile or dark-green and sandy, with **Lingula,** ostracods, and other small bivalves, and fish teeth. In **Dry Fork District** it is noted in the Dry Fork Section, the exposure being in Tucker County along the hill road just north of Red Creek. Here it is 20 feet thick, consisting of fire clay shale and dark shale, with plant fragments. On Horsecamp Run just southeast of Harperton it is again exposed in the public road at elevation 2830′

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[63]David B. Reger, Mercer-Monroe-Summers Rept., W. Va. Geol. Survey, pp. 525-529; 1926.

[64]Paul H. Price, Pocahontas Rept., W. Va. Geol. Survey, p. 524; 1929.

B., with a visible thickness of 15 feet and mostly composed of dark-green shale. In the Whitmer Section it is dark-green, sandy, and 40 feet thick, outcropping near the road fork north of the town.

No collections were made in the Sunbury because of other problems which seemed more urgent. Its position between the Broad Ford and Berea Sandstones, however, and its more or less typical nature, make its correlation reasonably certain.

Berea Sandstone.

The **Berea Sandstone**, or **Berea Grit** of Newberry[65], has been generally recognized as the basal member of the Pocono, and therefore as the beginning of the Mississippian Period of deposition in West Virginia, although this is not the case in southwestern Virginia, Kentucky, and Ohio where certain other earlier Mississippian formations sometimes occur beneath it. With the possible exception of the isolated deposits of Morgan County, where the relationships are not entirely clear, the Berea, when present, forms the Pocono floor, not only in West Virginia but in a considerable portion of Pennsylvania as well.

In Randolph County it is usually absent by unconformity but is present at a few localities in the southern and eastern portions. When found it is gray or greenish-gray, massive, coarse, and hard, with occasional beds of shale which contain plant fossils, and with occasional quartz pebble conglomerate, its thickness ranging up to 35 or 40 feet. In **Huttonsville District** it was not observed at outcrop but the Durbin Section, just across the line in Pocahontas County, records it as gray, 40 feet thick, with quartz pebbles, as exposed in the Staunton and Parkersburg Pike along the eastern slope of Back Allegheny Mountain. In **Mingo District** the Mingo Section notes it as occurring in the old county road south of Upper Mingo where it is 25 feet thick, greenish-gray, with some shale, and with plant stems and roots. In **Dry Fork District** the Elklick Section shows it to be 40 feet thick, massive, and conglomeratic. In the Dry Fork Section it is 25 feet thick, and shaly. In the Whitmer Section it is gray but only five feet thick.

Although widely quarried as a building stone in Ohio and parts of Kentucky the Berea Sandstone in Randolph County has such an irregular texture that its use for this purpose can scarcely be advised. Its chief economic interest

[65]J. S. Newberry, Report of Progress, 1869, pp. 21, 22, 29, Ohio Geol. Survey; 1870.

in the State is that of an oil or gas reservoir for which it is justly famous but in regions of outcrop it can not hold such materials. There is, of course, a possibility that it may have some gas along the western edge of the county, as will be later discussed.

ECONOMIC ASPECTS, POCONO SERIES.

At its localities of outcrop in Randolph County the Pocono Series offers little in the way of economic materials. It contains only the faintest traces of coal which could not possibly be regarded as commercial, its sandstones are generally too shaly and irregular to be used as building stone, and its shales are mostly too sandy to make brick or other ceramic wares. It affords no good agricultural soil, except that in certain localities the flat bench at its top preserves from erosion a thin deposit of loam principally washed down from the weathered Maccrady, Greenbrier, and Mauch Chunk. In the western part of the county, where it lies deeply buried below drainage, there is some possibility that its porous sandstones may hold natural gas, as will be later discussed in Chapter IX.

CHAPTER VIII.

STRATIGRAPHY—DEVONIAN ROCKS.

INTRODUCTION.

The Devonian System of rocks, coming next beneath the Mississippian, forms the oldest grand division of strata exposed above drainage in Randolph County. The principal areas are along the Deer Park Anticline in Tygart Valley and the valley of Leading Creek to the northward; on the drainage of Shavers Fork from Faulkner to the Tucker County line; and along the Blackwater Anticline principally in the valleys of Glady and Laurel Forks; in Middle Mountain which separates these two tributaries of Dry Fork; and in the region southeast of Horton. In this territory only the Upper Devonian is visible, the Middle and Lower being entirely beneath drainage.

The subdivisions available for surface study, as classified in descending stratigraphic order, are as follows:

	Feet.
Upper Devonian:	
Catskill Series	400 to 1,200
Chemung Series	2,500 to 3,000
Portage Series	2,000 to 2,500
Genesee Series	150 to 200
Totals	5,050 to 6,900

With the exception of a thin streak of limestone at the base of the Genesee these rocks are entirely of clastic origin, the Catskill, Chemung, and Portage consisting mostly of flaggy sandstones and sandy shales while the Genesee is a black, fissile shale. At its base the Landes Limestone is scarcely more than two feet thick and may be of transitional age between the Genesee and Hamilton, as will be later discussed.

CATSKILL SERIES.

GENERAL ACCOUNT, CATSKILL SERIES.

The Catskill Series, or upper subdivision, of the Devonian, makes up a very considerable part of the surface rocks of the county. In general it is composed of red or greenish-brown, shaly sandstones, most of which exhibit cross-bedding; and red or green, sandy shales, the varying color of which is evidently due to certain differences of the iron content. Various writers have ascribed the prevailing red color to lack of water cover during the time of deposition and this may or may not be the proper explanation. The sandstones are usually micaceous and often have inclusions of shaly conglomerate, but quartz pebbles are extremely rare. At some localities there are streaks of carbonaceous matter but coals of economic value are entirely absent. The thickness is about 400 feet in the northwestern part of the county but increases to fully 1200 feet in the southeastern corner, as exhibited in various sections in Chapter V.

SUBDIVISIONS, CATSKILL SERIES.

Little attempt has been made in West Virginia to subdivide the Catskill Series into members, due to the general similarity of the sandstones and shales and to the lack of any persistent faunas. In its upper part the Saxton Shale can apparently be recognized on account of its floral content, as will be later discussed.

TOPOGRAPHIC EXPRESSION, CATSKILL SERIES.

Many of the Catskill outcrops are along the lower slopes of mountain ranges between which lie anticlinal valleys. In such position the series is usually cut into transverse foothills the ridges of which are rounded somewhat after the fashion of an inverted U. Toward the eastern part of the county the series thickens and contains a greater relative proportion of sandstone, causing the slopes to become abrupt and at some localities precipitous.

AREAL EXTENT, CATSKILL SERIES.

Figure 11 shows at a glance the territory of Catskill outcrop and on Map II these areas are delineated in greater detail. In **New Interest District** there is a belt following the eastern slope of Laurel Ridge west of Leading Creek, and another along the lower slope of McGowan Mountain east of Shavers Fork. In **Leadsville District** the Laurel Ridge outcrop above mentioned passes southward and crosses Tygart River east of Aggregates and then extends southward along Rich Mountain. Another occurs on the lower western slope of McGowan Mountain, passing southward across Shavers Fork near Lumber and thence along the western slope of Cheat Mountain to the Beverly District line. In **Beverly District** one outcrop follows the eastern slope of Rich Mountain and another the western slope of Cheat Mountain,

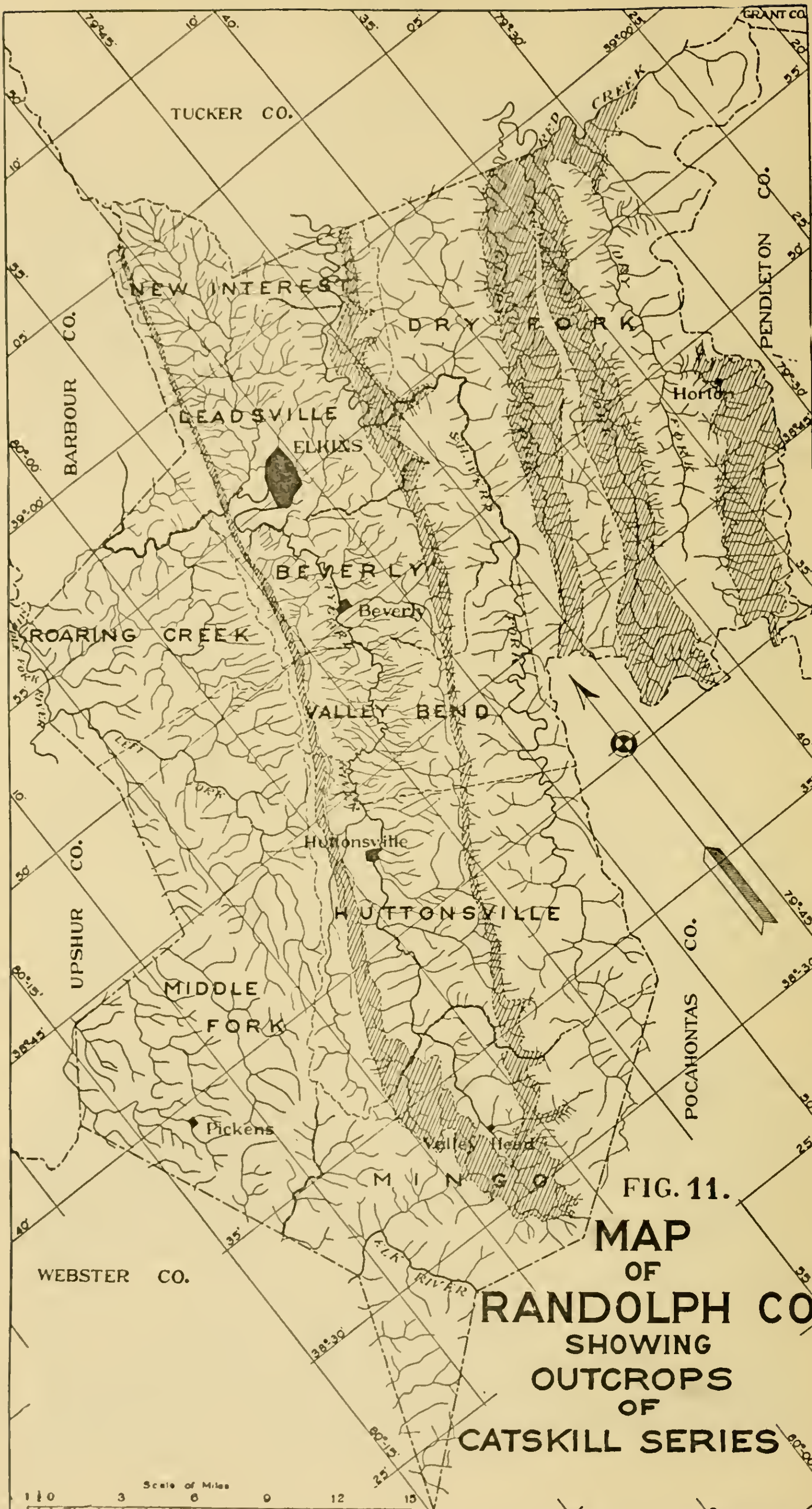

FIG. 11.
MAP OF RANDOLPH CO. SHOWING OUTCROPS OF CATSKILL SERIES

In Valley Bend and Huttonsville Districts the same outcrops are continued on either side of Tygart Valley. In Mingo District the outcrop makes a wide, semicircular loop from Elkwater Fork to Mingo and thence eastward and northward to the district line at Stewart Run. In Dry Fork District there is a broad outcrop extending from the Tucker County line southward to Pocahontas County along the valley of Glady Fork and another along the valley of Laurel Fork, these two areas being separated by a strip of Chemung along the axis of the Blackwater Anticline. Farther east the Dry Fork Valley is occupied by Catskill from Jenningston to Spruce Run below Harman and the same belt extends up Red Creek nearly to Laneville. In the southeastern corner the immediate valley of Gandy Creek and most of the western slope of Allegheny Mountain from Whitmer to the Pocahontas County line are Catskill.

CONTACTS, CATSKILL SERIES.

The upper contact of the Catskill with the Pocono or other series of the Mississippian has already been discussed, a considerable unconformity being noted. At its base the Catskill rests on the Chemung Series of the Devonian without evident angularity but with a marked change in lithology and fossil content. Here the green and highly marine beds of the Chemung suddenly disappear, giving place to the red and practically barren Catskill, there being some occasional interfingering of red and green. In the Catskill, also, ferns with distinguishable foliage appear, in contrast to the little understood Chemung plants which exhibit scarcely any vestige of recognizable foliage. At the contact stage the Hendricks Sandstone, forming the upper member of the Chemung, is often conglomeratic.

FOSSIL LIFE, CATSKILL SERIES.

In the Catskill there is a rather abundant and highly interesting fern flora, including Archaeopteris and Dimeripteris, found mostly in the pale-green shales below some of the sandstones. In some localities, also, there are many small, silicified tree trunks, some of which are as much as one foot in diameter but practically all of which are almost barren of leaf scars or other distinguishable markings and without any preservation of internal cell structure. Some of these trunks are found at the top of shale beds where the vegetation appears to have been suddenly swept down and obliterated by heavy deposits of sand. Fossil Lots 355, 360, 375, 376, 410, 411, 439, 445, and 451 were collected from the plant fossils of various stages of the Catskill in or near Randolph County, and were mostly forwarded to Dr. David White at Washington, who also helped with the collections. Several of these localities were later inspected by Dr. Richard Kraeusel, of the University of Franklin-on-Main, Germany, in the course of a study of North American Devonian plants. Their study has not yet been completed but such identifications as are available will be found in subsequent descriptions or in Chapter XIV.

Marine fossils are rare but in a few localities there are pelecypods and fish remains. Fossil Lots 440 and 446 were collected by the writer, the former being examined by Dr. Tilton whose identifications appear in this Chapter and are further discussed by him in Chapter XV.

CORRELATION, CATSKILL SERIES.

The name of the Catskill Series is obtained from New York State from which it has been traced without interruption southwestward across Pennsylvania, Maryland, and into West Virginia so that little doubt can be entertained regarding its proper nomenclature. It correlates, also, in large measure with the Hampshire Formation, as described in various United States Geological Survey Folios and in certain State reports northeast of West Virginia. On the south and southwest it disappears completely from the stratigraphic column and hence has no correlatives but on the north and northwest there is a considerable possibility that the Bedford of northwestern Pennsylvania and northeastern Ohio may be of Catskill age. It is very true that some authors regard the Bedford as Mississippian while others put it in the Devonian. Without having had an opportunity to study the Bedford in the field the writer is inclined to the view that parts of it, at least, belong to the Catskill.

Various writers have suggested the idea that the Catskill should not be considered as a separate series but rather as a landward phase of the Chemung Series, with a progressively increasing marine content and a loss of red color as the deeper water zone is approached. With that theory the visible evidence in many, and perhaps all, West Virginia counties is not in harmony. It is no doubt true that the Chemung was laid down in deeper and saltier water than the Catskill but it is not evident that the two are of concurrent origin.

DESCRIPTION OF MEMBERS, CATSKILL SERIES.

Portion above the Saxton Shale.

It has been previously stated that the Catskill Series has not been divided into members in West Virginia. The writer is inclined to the opinion that it could be done if given sufficient study. In the oil and gas fields of northern West Virginia and southwestern Pennsylvania its sands are named and traced from well to well with fair accuracy by drillers and geologists. Its surface exposures reveal certain progressive differences, especially in floral content, and might exhibit others to a patient investigator. As a beginning the writer several years ago traced an **Archaeopteris** shale almost continuously from central Pennsylvania into West Virginia, naming it the Saxton Shale, as will be later described. It is now possible to discuss the portion of the series lying above the Saxton Shale in Randolph County as a separate stage.

These upper beds vary from 50 to 150 feet in thickness, being composed principally of red shale but also having a few ledges of shaly or cross-bedded red sandstone. Rarely there are streaks of pale-green shale which may or may not carry fragments of **Archaeopteris.** In **Mingo District** plants were found in the extreme top of the series on the Point Mountain road between Valley Head and Monterville, as recorded in the Valley Head Section, page 173. Here **Fossil Lot 409** was collected by Dr. David White and the writer, **Archaeopteris hybernica** being identified in the field and **Archaeopteris sphenophylloides?** being suggested by certain fronds.

Saxton Shale.

The **Saxton Shale** of Reger[1], coming at a varying interval of 50 to 150 feet below the top of the Catskill, can usually be recognized with ease in Randolph County. It is almost invariably a pale-green, argillaceous, laminated or chunky shale, 5 to 25 feet in thickness, with a fairly constant **Archaeopteris** flora, and with pelecypods and fish remains, including numerous plates of the latter. In **Leadsville District** it is noted in the Aggregates Section as 15 feet thick, green, red, and variegated, with fossil plants, as exposed in the excavation for a cottage along the State road just east of the river gap. On a road ascending Laurel Ridge it is visible 0.4 mile east of Laurel Hills School at elevation 2390′ B., where it is green and contains plant leaves. In **Beverly District** it is well exposed in the Staunton and Parkersburg Pike on the eastern side of Rich Mountain at the sharp turn of the road below the old limestone quarry, as noted in the Beverly Section. Here it is pale-green and fissile, with plant fossils, pelecypods, and fish plates. **Fossil Lot 360** was collected by Dr. David White and the writer, **Archaeopteris, Dimeripteris,** and **Psylophyton princeps?** having been provisionally identified in

[1]David B. Reger, Pocono Stratigraphy in the Broadtop Basin of Pennsylvania, Bull. Geol. Soc. Am., Vol. 38, pp. 406-7; 1927.

the field. The following exposure was noted in the valley of Shavers Fork:

Local Measurement at Fossil Lot 355.

Beverly District; in cut of Western Maryland Railway on south side of Shavers Fork of Cheat River, 0.3 mile northwest of Meadows Station; gentle southeast dip; arrangement in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.
Catskill Series (17′+)		
1. Shale, red	10	10
2. Shale, **Saxton**, green, with plant fossils; **Lot 355**	5	15
3. Sandstone, gray, with coaly plant stems, to grade (2195′ B.)	2	17

No examination of the above collection has yet been made.

In **Valley Bend District** the Saxton was not noted but there is a closely adjacent outcrop in the cut of the Western Maryland Railway on West Fork of Greenbrier River 1.3 miles north of Wildell, Pocahontas County, as follows:

	Feet.
1. **Shale, Saxton**, pale-green, with abundant plant fragments (3110′ B.)	10
2. Shale, red and green, sandy at top	10
3. Sandstone, greenish-brown	10
4. Shales, red and green, rather sandy, to end of cut (dip, N. W., 15°)	30

In the Durbin Section, also in Pocahontas County, the exposures in the Staunton and Parkersburg Pike just above the point where the Back Allegheny Mountain road turns southward reveal fish plates in a red shale with green streaks, coming 50 to 75 feet below the top of the Catskill. From this zone **Fossil Lot 446** was collected. Just at the road fork there is a green sandstone 75 to 100 feet below the top of the series containing the leaves of **Archaeopteris** and many large, silicified plant stems from which **Fossil Lot 451** was collected.

In **Mingo District**, as noted in the Valley Head Section, the Saxton was recognized in the State road southeast of Monterville as a pale-green shale, 10 feet thick, coming 95 to 105 feet below the top of the series and containing plant leaves. The followng exposure was noted along the Seneca Trail:

Local Measurement at Fossil Lot 375.

Mingo District; in the State road along eastern side of Tygart River, 0.1 mile south of Mingo and about 300 feet south of Mingo

Church; dip, westward, 5°; measured along strike with aneroid and arranged in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.
Catskill Series (31′+)		
1. Shale, red, sandy, visible	15	15
2. Shale, Saxton, pale-green, chunky, argillaceous, with a 1″ carbonaceous streak near the base (2690′ B.), and with marine and plant fossils; Lot 375	3	18
3. Shale, red, poorly exposed	3	21
4. Sandstone, red, ripple-marked, and cross-bedded	10	31

At the above locality there are pelecypods, fish teeth, and plant fossils. The original collection was made by the writer but a second collection was made with the help of Dr. David White and shipped to Washington, but apparently has not yet been examined.

In the old county road ascending the mountain just southeast of Upper Mingo there is a very good exposure of the Saxton Shale, as recorded in the Mingo Section, page 179. Here it is 25 feet thick, mostly pale-green but red toward the top, coming 55 to 80 feet below the top of the series, and containing pelecypods and brachiopods (Lingula), fish scales and plates, and plant fossils, including Dimeripteris and Archaeopteris?. Fossil Lot 376 was collected with the help of Dr. David White from whom no further report is at hand.

In **Dry Fork District** the Saxton Shale was recognized on Glady Fork along the mountain road slightly west of Evenwood, as indicated in the Evenwood Section, page 193, coming 75 to 90 feet below the top of the series and containing fossil plants.

Portion below the Saxton Shale.

The portion of the Catskill Series below the Saxton Shale, comprising the main bulk of the series, has not been subdivided into members but was carefully studied, as recorded in the measured sections of Chapter V. It contains many reddish-brown or greenish-brown sandstones, numerous red shales, and occasional pale-green shales, the latter being often fairly rich in plant fossils. In **Leadsville District** the Aggregates Section shows a two-inch streak of impure coal, with numerous plant stems, 335 feet below the top of the series. At 444-464 feet below the top there is a bed of green, fissile shale containing plants from which Dr. David White and the writer obtained **Fossil Lot 411**, the contents of which are not yet available.

In **Beverly District** one of the sandstones carries quartz pebble conglomerate along the Western Maryland Railway in the vicinity of Lumber Station on Shavers Fork. In **Huttonsville District** the total Catskill in the Cromer Top Section along the Staunton and Parkersburg Pike on the western slope of Cheat Mountain is 760 feet but the Saxton Shale was not recognized. In the Durbin Section, on the same highway down the eastern slope of Back Allegheny Mountain the total Catskill is 630 feet. Beneath the Saxton Shale, which has already been discussed, there are numerous fossil tree trunks in the base of a sandstone at 410 to 440 feet below the top of the series, with fronds of **Archaeopteris** and **Dimeripteris, Fossil Lot 428** having been collected at this zone. Farther down, at 540 to 580 feet below the top, **Dimeripteris** was found, **Fossil Lot 427** having been collected by Dr. David White, Paul H. Price, and the writer.

In **Mingo District** there is a very good exposure of the entire Catskill along the State road ascending Point Mountain, as recorded in the Valley Head Section, the thickness being 635 feet. Beneath the Saxton, which has already been discussed, there is a huge bed of red, green, and variegated shale, at 105 to 225 feet below the top, carrying **Dimeripteris** near the base from which Dr. David White and the writer collected **Fossil Lot 410**. A chemical sample **(No. 690R)** was collected from this shale on the land of **Isaac Painter**, the composition of which is reported by Kaplan and Sigwart as follows:

	Per cent.
Silica (SiO_2)	61.43
Ferric Iron (Fe_2O_3)	8.70
Alumina (Al_2O_3)	19.90
Magnesia (MgO)	1.36
Loss on Ignition	4.67
Undetermined	3.94
Total	100.00

Shale of this character should make brick, drainage tile, or building tile.

At about 375 feet below the top there is an abundant **Dimeripteris** zone from which Dr. David White and the writer collected **Fossil Lot 439**.

In **Dry Fork District** the total Catskill in the Evenwood Section is 1055 feet. In a sandstone about 875 feet below the top there are plant fossils and vertical tube-like fillings which the writer took to be **Scolithus** from which **Fossil Lot 440** was collected. Dr. Tilton, to whom the collection was referred, is inclined to doubt this field identification, as discussed by him in Chapter XV.

On the west side of Gandy Creek, along the Spears Lumber Company Railroad south of Horton and 1.1 miles northeast of White, there is a sandstone ledge from which numerous smooth trunks of trees protrude, the largest noted being one foot in diameter. Here Fossil Lot 445 was collected, but time was not available to search for foliage or to measure a section. The horizon is estimated as about 300 feet below the top of the series.

ECONOMIC ASPECTS, CATSKILL SERIES.

It has already been stated that some of the red shales of the Catskill should make building brick, drainage tile, or building tile and at certain localities suitable outcrops can be found along transportation. Many of these shale beds, however, contain included lenses of sandstone or very sandy shale. Such localities should be avoided as the material might not have enough plasticity. The sandstones, as a rule, are too shaly for building stone, but might have a limited use at some localities. The dark-red ledges would give a pleasing architectural effect. Many of these same sandstones in western counties hold oil and gas and there is some possibility that gas might be found along the western edge of Randolph where they are deeply buried below drainage. The shales weather to a light, loamy, red soil which is easily tillable and is suitable for various farm crops, especially when sufficiently fertilized.

CHEMUNG SERIES.

GENERAL ACCOUNT AND SECTION, CHEMUNG SERIES.

The Chemung Series, coming next beneath the Catskill, makes extensive outcrops in Randolph County, being in many respects better exposed and more interesting than in any other West Virginia county. Generally it is composed of alternating beds of olive-green, flaggy sandstone, and olive-green, sandy or argillaceous shale. Some of the sandstones, particularly the Hendricks at the top, frequently become massive and occasionally carry small, flattened and elongated pebbles of white quartz and darker silicates, and usually have ferruginous or slightly calcareous zones in which there are abundant marine fossils. In some of these ledges, also, or within the shales which often divide them into benches, there are many silicified stems of trees and plants. The thickness of the series appears to vary from 2500 to 3000 feet, being 3147 feet at Aggregates and 2818 feet at Beverly.

The following general section, modified and amplified to some slight extent from a former publication by the writer[2], exhibits the more important characteristics of the series in Randolph County:

General Section of the Chemung Series for Randolph County.

	Thickness. Feet.	Total. Feet.
1. Sandstone, Hendricks, greenish- or reddish-brown, partly flaggy, partly massive, with elongated and flattened pebbles of white quartz or darker silicates; occasional carbonaceous streaks; usually contains flattened plant stems, often 4 to 6" wide; abundant marine fossils; branching bryozoa, Camarotoechia subarcuata, Grammysia subarcuata, Sphenotus contractus, Liopteria bigsbyi, Leptodesma medon, cephalopods ----------	25 to 75	75
2. Upper Shales; mostly olive-green, sandy shales with rare streaks of red; and greenish or reddish-brown, mostly flaggy, and often ripple-marked sand-sandstones; abundant marine fossils;----	300 to 325	400
3. Sandstone, Valley Head, partly greenish-brown and partly reddish-brown, thick-bedded with streaks of shale between, partly ripple-marked and having occasional small white quartz pebbles; contains abundant tree trunks at type locality, mostly smooth-surfaced; largest diameter measured 4' 0"; also contains numerous marine fossils; sponge markings, Liparocrinus halli, crinoid stems, Fenestella sp., Batostomella sp., Leptostrophia perplana var. nervosa, Douvillina cayuta, Schuchertella chemungensis, Productella lachrymosa, Dalmanella sp., Camarotoechia contracta, Camarotoechia eximia, Atrypa hystrix, Spirifer disjunctus, Spirifer mesacostalis, Ambocoelia umbonata, cephalopods, Grammysia undata; Pterinea nodocosta, Sphenotus contractus, Leptodesma elongata, Paleanatina gregaria, Palaeoneilo filosa, Cypricardella sp., Cypricardinia elegans, Loxonema sp., Holopea sp. ----	50 to 100	500
4. Middle Shales; mostly shales with thin sandstones like No. 2; abundant marine fossils; crinoid stems, branching bryozoa, Schuchertella chemungensis, Productella lachrymosa, Camarotoechia eximia, Spirifer disjunctus, Spirifer mesacos-		

[2]David B. Reger, The Tygart Valley Devonian Trees of West Virginia, Am. Jour. Sci., Vol. XV, pp. 51-57; January, 1928.

	Thickness. Feet.	Total. Feet.
talis, Ambocoelia umbonata, Liopteria bigsbyi, Leptodesma medon	650 to 750	1250
5. Sandstone, Elkins, greenish-brown or mud-colored, generally composed of iron-stained flags or thicker beds all separated by irregular deposits of green shale; infrequent carbonaceous streaks; contains many plants, including flattened and carbonized stems, semiflattened or elliptical trunks, stumps, rootlets, and small branches, no foliage yet noted; largest diameter measured 10′ 6″; also abundant marine fossils throughout; Zaphrentis chemungensis, concentric sponge?, crinoid stems, Fenestella sp., branching bryozoa, encrusting bryozoa, Leptostrophia perplana var. nervosa, Douvillina cayuta, Productella lachrymosa, Schuchertella chemungensis, Camarotoechia eximia, Schizophoria striatula, Atrypa spinosa, Atrypa hystrix, Spirifer disjunctus, Spirifer mesacostalis, Spirifer mesastrialis, Ambocoelia umbonata, Palaeoneilo angusta?, Pterinea nodocosta, Pterinea chemungensis, Ectenodesma birostratum, Leptodesma medon?, Cypricardella?, Tentaculites sp.	450 to 500	1750
6. Lower Shales, mostly shales and thin sandstones like Nos. 2 and 4; abundant marine fossils, including vast numbers of Ambocoelia umbonata at extreme base; and plant impressions (fucoids?), crinoid stems, Douvillina cayuta, Schuchertella chemungensis, Chonetes scitulus?, Dalmanella tioga, Camarotoechia contracta, Spirifer mesacostalis, Ambocoelia umbonata, Tentaculites sp.	1025 to 1250	3000

The marine fossil lists, as above included, are furnished by Dr. John L. Tilton, as published by him in a previous paper[3], and as identified from the collections of the writer in Randolph County and from those of Paul H. Price in Pocahontas County, next adjacent to Randolph on the south.

SUBDIVISIONS, CHEMUNG SERIES.

In the above general section a six-part subdivision of the Chemung Series is indicated, three of which contain abundant fossilized remnants of plants. The problem of their relationship to the subdivisions and named members of other authors

[3]John L. Tilton, Marine Faunas of the Devonian Tree Horizons of Tygart Valley, West Virginia, Am. Jour. Sci., Vol. XVII, pp. 347-351; April, 1929.

in territory farther northeast is intriguing and will be given brief discussion under the subject of "Correlation".

TOPOGRAPHIC EXPRESSION, CHEMUNG SERIES.

The Chemung Series almost invariably weathers to sharp, roof-shaped ridges and narrow, V-shaped valleys, with steep hill slopes which are neither convex nor concave. These forms are remarkably constant, regardless of whether the beds lie in horizontal position or dip at steep angles. Bold ledges of outcropping sandstone are quite rare, and must usually be sought in railroad and highway excavations.

AREAL EXTENT, CHEMUNG SERIES.

Figure 12 shows the outcropping areas of Chemung rocks in Randolph County, and on Map II these regions may be studied in more detail. First, there is an elliptical-shaped loop surrounding the Deer Park Anticline, the northern end of the loop being at the head of Leading Creek in New Interest District; its western side being on the eastern lower slope of Rich Mountain west of Tygart Valley in New Interest, Leadsville, Beverly, Valley Bend, and Huttonsville Districts; its eastern side being on the northern end of Cheat Mountain north of the Durbin Branch of the Western Maryland Railway and on the western lower slope of the same mountain farther south, and located in the same districts as the western side of the loop; and its southern end being near the head of Tygart Valley in Mingo District. Second, there is a long area in Dry Fork District along the Blackwater Anticline, starting on Laurel Fork two or three miles south of Jenningston, extending up this fork, diagonally across and along Middle Mountain, and up East Fork of Glady Fork to the Pocahontas County line.

CONTACTS, CHEMUNG SERIES.

The upper contact of the Chemung Series with the Catskill, where there are decided changes in faunal and floral content and in lithologic appearance, has already been discussed. Its lower contact with the Portage Series is less abrupt and less easily recognized. Here the basal beds of the Chemung which are olive-green in color and which contain marine fossils, usually including abundant Ambocoelia umbonata, rest on the greenish-gray flagstones and shales of the Portage which are usually almost barren of fossils. The Portage sediments, also, are slightly weaker and nearly always make lower topographic ridges, giving a valuable hint as to the proper region of the contact. All of these differences must be utilized to the fullest extent in searching for the

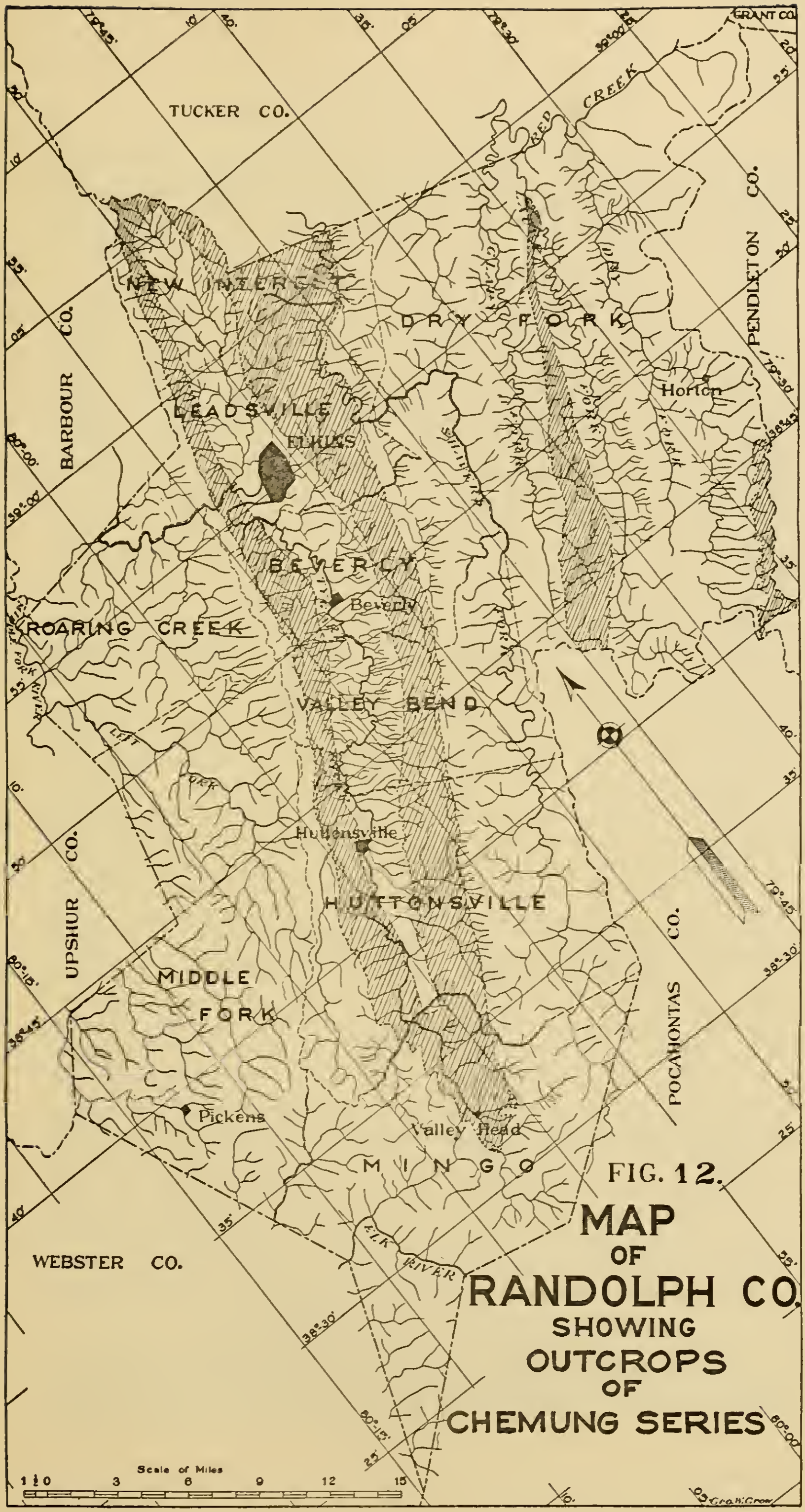

FIG. 12.

MAP
OF
RANDOLPH CO.
SHOWING
OUTCROPS
OF
CHEMUNG SERIES

boundary. The color change, while real, is often difficult to perceive, and the presence or absence of fossils must be determined by patient study. No angular unconformity is apparent.

FOSSIL LIFE, CHEMUNG SERIES.

The general section above published indicates to some extent the variety of fossil forms to be found in the Chemung of the county but does not measure their abundance. The plant life, for a series of such great antiquity, is literally astounding both in its abundance and in the evident size of the specimens, and at the same time almost utterly baffling because of the general lack of foliage, cortical markings, cell structure, or other criteria required for identification. The three horizons which principally hold these tree remnants will be later described in detail. From them the writer, with the very welcome assistance of Dr. David White at several localities, collected Fossil Lots 366, 367, 374, 387, 388, 390, 394, 395, 396, 397, 399, 401, 402, 407, 413, and 438. Some of these collections are in Morgantown and some in Washington, having received little attention through force of circumstances beyond the control of either Dr. White or the writer. Some of these localities were also inspected later by Dr. Richard Kraeusel of the University of Frankfort-on-Main, Germany. Various half-tones in this volume indicate to some extent the appearance of some of these plants but a patient study of months should be given before venturing authoritative discussion.

The marine life, on the other hand, is not only abundant but exceptionally well preserved, and will profitably reward any paleontologist for whatever time he can give it. The localities in Tygart Valley are well situated for convenient study and the beds are equally well exposed in railroad and highway cuts. On the Blackwater Anticline the situation is almost exactly the opposite. Within or adjacent to Randolph County the writer collected from the marine phases of the Chemung Fossil Lots 350, 351, 354, 357, 358, 359, 361, 362, 363, 364, 365, 373, 389, 400, 437, and 441. These were studied by Dr. Tilton whose identifications, along with certain other collections in Pocahontas County, are summarized in the general section of the Chemung Series, pages 362-3, and whose further comment will be found in Chapter XV. At various other places in this volume these collections have been noted or will be later mentioned.

CORRELATION, CHEMUNG SERIES.

The practical identity of the Chemung Series in West Virginia with the original formation bearing the same name in New York State is too well known to require extensive comment in this volume. The Chemung of New York has been traced continuously southwestward across Pennsylvania, Maryland, and West Virginia, into southwestern Virginia where it soon disappears from the stratigraphic column. In northeastern Ohio the relationships are not so sure, but there appears to be rather good ground for belief that the Bedford is largely correlative with the Catskill and that the underlying Cleveland Shale and Chagrin Formation represent a somewhat attenuated phase of the Chemung, especially since the Chagrin carries **Spirifer disjunctus** and other common Chemung fossils.

Aside from these broad aspects of Chemung correlation the relationship of the six subdivisions of the Randolph County Chemung to classifications which have been used in Maryland and Pennsylvania is of much interest. In Pennsylvania I. C. White, John J. Stevenson, and others have generally used a five-part subdivision, partly with names and partly without them. In these subdivisions two heavy sandstones or conglomerates have been generally recognized. Farther west in Maryland Dr. C. S. Prosser has recognized a third conglomerate at the extreme top of the Chemung next to the Catskill, and Dr. Chas. K. Swartz has employed the five-part subdivision of White and Stevenson in listing the range of Chemung fossils. Without laborious discussion a parallel may now be drawn between the combined Chemung sections of Maryland and Pennsylvania on the one side, and those of Randolph and adjacent counties of West Virginia on the other, which is as follows:

Maryland and Pennsylvania	West Virginia
Highest conglomerate (unnamed), of Prosser in western Maryland.	Hendricks Sandsone (conglomeratic) of Reger and W. A. Price.
Shales.	Upper (Chemung) Shales.
Upper Conglomerate of Stevenson or Lackawaxen Conglomerate of White.	Valley Head Sandstone (conglomeratic) of Reger.
Shales and sandstones.	Middle (Chemung) Shales.
Lower Conglomerate of Stevenson, or Allegrippus Conglomerate of White.	Elkins Sandstone (seldom conglomeratic in Randolph but pebbly along the Potomac) of Reger.
Shales and flags.	Lower (Chemung) Shales.

The relationship of the conglomerates of Maryland and Pennsylvania to those of West Virginia has already been discussed at some length in previous reports of the writer[4] and

[4]David B. Reger, Mineral and Grant Rept., pp. 296-300 (1924); and Mercer-Monroe-Summers Rept., pp. 538-9 (1926); W. Va. Geol. Survey.

it has been shown that they persist into the latter State. As indicated in the above comparative correlation it is now probable that the three known Chemung conglomerates of Maryland represent the three recognized Chemung tree-fossil horizons of Randolph County, some of which have now been traced by their plants from the North Branch of Potomac River at Keyser, West Virginia, southward through Mineral, Tucker, Randolph, and Pocahontas Counties, West Virginia, to Highland County, Virginia. Furthermore, it is a most singular thing that scarcely any mention of Chemung plants may be found in the Devonian literature on Maryland and Pennsylvania. There is good reason to believe that many of the Chemung trees of Randolph County did not grow in the localities where they are now found but on the other hand were washed northwestward by floods which at the same time may have carried quartz pebbles into the three States. It is not logical to believe that Devonian trees of such evident size existed only along a comparatively brief strip opposite West Virginia. It is rather to be supposed that these plants, which are found not only in the Chemung but in the Portage as well, extended without much interruption from Virginia northeastward to New York State and to the Gaspe Peninsula of Quebec.

DESCRIPTION OF MEMBERS, CHEMUNG SERIES.

Hendricks Sandstone.

The **Hendricks Sandstone** of Reger and W. A. Price[5] forms the upper stratum of the Chemung Series in Randolph County. Generally it is greenish-brown or reddish-brown, partly flaggy and partly massive, with elongated and flattened pebbles of white quartz or darker silicates, and with occasional carbonaceous streaks. It usually contains flattened plant stems some of which are from four to six inches in diameter and it almost invariably carries marine fossils as indicated in the general section, page 362. **Fossil Lots 361, 400, and 441** were collected from its horizon, as will be later discussed.

In **Leadsville District** the Hendricks outcrops on the Elkins-Belington road at the first ravine west of the two railroad bridges which cross Tygart River just west of Buxton. Here there is a visible conglomerate ledge about two feet thick, with marine fossils, the remainder of the bed being concealed, as indicated in the Aggregates Section. On the old Morgantown Pike toward the summit of Laurel Ridge,

[5]David B. Reger and W. Armstrong Price, Tucker Rept., W. Va. Geol. Survey, pp. 245-251; 1923.

PLATE XXXV.—View looking northwest down Gandy Creek with Horton Mill of Spears Lumber Company in foreground. High point at extreme rear is a peak of Rich Mountain (Haines Knob? or Gregg Knob?) mostly formed by Mauch Chunk. Slope at left is mostly Greenbrier and Pocono but mill site and slope at right are Catskill.
(Photo. by U. S. Forest Service.)

PLATE XXXVI.—View of Spruce Knob, Pendleton County, looking northeastward with approximate line of Spruce Mountain. Ledge and boulders capping knob are Upper Raleigh (Sharon) Sandstone of Pottsville. Farther down a slight shoulder of Princeton Sandstone of Mauch Chunk is visible. This knob, at elevation 4860 feet, is highest point in West Virginia. (Photo. by U. S. Forest Service.)

PLATE XXXVII.—Gates and Bailey quarry at northern end of Rich Mountain northwest of Elkins. Entire quarry is in Union Limestone of Greenbrier Series with Fredonia portion at base followed by shaly Bethel Sandstone zone in middle and Gasper portion at top. Some boulders of Alderson Limestone are visible above quarry.
(Photo. by E. E. Harris.)

PLATE XXXVIII.—Large sink-hole in Greenbrier Series just east of Monterville, looking north, with Rich Mountain capped by Pottsville in extreme background. At extreme right is a Pocono dip slope. (Photo. by E. E. Harris.)

as recorded in the Morgantown Pike Section, it is 20 feet thick, greenish-brown, pebbly, and hard, with marine fossils. In the Kelley Mountain Section it is noted as occurring at the road fork in the gap east of Tunnel Station, where it is greenish-brown, with quartz pebbles and with plant stems, many of which are visible in a roadside stone pile. From this locality eastward it makes most of the dip slope down to the eastern portal of the tunnel and beyond almost to Shavers Fork, while to the immediate north of this locality toward the Canfield School it may be observed at many points along the eastern slope of Cheat Mountain.

In **Beverly District** the Hendricks makes a prominent ledge along the Staunton and Parkersburg Pike on the eastern slope of Rich Mountain, as recorded in the Beverly Section. Here it is 75 feet thick, greenish-brown, with flattened pebbles of white quartz and of some very dark silicate, and with marine fossils and plant stems. **Fossil Lot 361** was collected from the animal fauna and according to Dr. Tilton, as later discussed by him in Chapter XV, contains branching bryozoa, **Camarotoechia subarcuata, Sphenotus contractus, Liopteria bigsbyi?, Leptodesma medon,** and **Orthoceras** sp. Southeast of Beverly it is prominent in the northeastern slope of Elliott Ridge, containing plant stems, crinoids, brachiopods, and pelecypods, and considerable quartz conglomerate, as may be noted by traveling the new road from Chenoweth Creek to Left Fork of Files Creek. Farther south it crops in Limekiln Ridge and Millstone Gap Ridge and its conglomeratic boulders litter the road up Right Fork of Files Creek, some of the pebbles being more than one inch long.

In **Valley Bend District** the conglomerate boulders from the Hendricks are visible in the Harper Trail slightly east of the Right Fork of Files Creek road. West of Tygart Valley the ledge is visible at elevation 2430′ B. in the highway which ascends Rich Mountain just west of Right Fork of Mill Creek 1.7 miles northwest of Valley Bend. Here it is 60 feet thick, partly massive and partly thin-bedded, with quartz and shale conglomerate, and with marine fossils among which **Spirifer disjunctus** and some small pelecypods were noted.

In **Huttonsville District** it is visible along the Staunton and Parkersburg Pike on Riffle Creek in the vicinity of Riffle Creek School and northward along the road. In the same road it outcrops in the edge of Durbin, Pocahontas County, slightly east of the bridge across West Fork of Greenbrier River, as indicated in the Durbin Section. Here it contains crinoids and **Camarotoechia**, no measurement of its thickness having been made. On Becky Creek of Tygart River, one mile south of Rosenkrantz School, it is 20 feet thick, at elevation 2530′ B., thick-bedded, and with quartz pebbles and marine fossils, including pelecypods and Camarotoechia.

In Mingo District the Hendricks makes an interesting outcrop in the bluff north of Ralston Run and the State road slightly west of Valley Head, as indicated in the Valley Head Section. Here it is 25 feet thick and contains brachiopods and pelecypods. In the vicinity of Logan Run, on the Seneca Trail south of Valley Head, its outcrop may be noted at several points. Slightly north of the mouth of the run its upper ten-foot portion is exposed, with flat quartz pebbles and with Camarotoechia. South of the run it makes the long, sharp ridge which sticks out between Logan Run and the river. Here the following information was obtained:

Local Measurement at Fossil Lot 407.

Mingo District; in bluff east of Seneca Trail and east of Tygart River 1.6 miles south of Valley Bend; strata dip slightly to westward: arrangement in descending stratigraphic order.

		Feet.
1.	Red shales of Catskill Series, not measured	--
2.	Sandstone, Hendricks (2530′ B.), greenish-brown, massive, with some streaks of shale, pockets of sulphurous coal, marine fossils (Camarotoechia), and plant stems; Fossil Lot 407 from plants	30
3.	Shale, greenish-brown, to road	10

At the above locality Dr. David White and the writer recovered some interesting plant stems which evidently have not yet been studied.

In Dry Fork District the Hendricks Sandstone outcrops along the road north of Flannigan Run 0.8 mile east of Evenwood, being greenish-brown and 20 feet thick, and containing crinoids, as indicated n the Evenwood Section. On Middle Mountain it is visible in the highway just north of Wymer; and on the same mountain road 1.7 miles north of Wymer it is exposed at elevation 3275′ B., being greenish-brown, thick-bedded, and containing white quartz pebbles, plant fossils, and trail markings.

In the edge of Pendleton County Fossil Lot 441 was collected along the Spears Lumber Company Railroad on the head of Seneca Creek 1.1 miles northeast of Gatewood and 1.8 miles northwest of Spruce Knob, being apparently at the horizon of the Hendricks, although the deposit was mostly green sandy shale. Dr. Tilton reports the collection as containing crinoids and pelecypods with no particular evidence of Hendricks fauna.

In the Roaring Run Section, page 195, the character of the Hendricks Sandstone at its type locality near Hendricks, Tucker County, is exhibited, there being two beds of sandstone separated by shale. **Fossil Lot 400,** collected at this locality, was examined by Dr. Tilton and contained plant stems (algae), branching bryozoa, **Camarotoechia subarcuata, Sphenotus contractus,** and **Leptodesma medon.**

So far as known the Hendricks Sandstone has not been quarried but at some localities it is sufficiently massive and durable to make a very good building stone for local purposes and its texture should be pleasing, but it might be troublesome to split and dress.

Upper (Chemung) Shales.

In the general section the shales and thin sandstones, coming between the Hendricks and Valley Head Sandstones, are mentioned as the "Upper Shales", mainly for convenience of description rather than as a formal geologic name. These beds mostly consist of olive-green, sandy shales, and greenish-brown or reddish-brown, ripple-marked flagstones with a total thickness of 300 to 325 feet. Generally the shales are only sparingly fossiliferous but in the ferruginous portions of the sandstones there are often many marine fossils. In Chapter V the position and character of these shales may be noted in the measured sections for Beverly, Kelley Mountain, Roaring Run, and Valley Head. No fossil collections were made at this stage.

Valley Head Sandstone.

The **Valley Head Sandstone** of Reger[6], coming 300 feet or more below the Hendricks Sandstone, is a conspicuously arenaceous zone composed mostly of greenish-brown and reddish-brown, thick-bedded sandstone ledges, separated by thin beds of shale, the total thickness being about 100 feet. Ripple-marks are frequent and small white quartz pebbles are not uncommon. In addition to a very considerable marine fauna, as listed in the general section, page 362, this horizon is distinguished by its content of large tree trunks.

In **Leadsville District** it is prominent in the Elkins-Franklin road on the western slope of Cheat Mountain, as detailed in the Kelley Mountain Section. Here it is 45 feet thick, greenish-brown, and ferruginous, and contains both marine

[6]David B. Reger, The Tygart Valley Devonian Trees of West Virginia, Am. Jour. Sci., Vol. XV, pp. 49-57; January, 1928.

and plant fossils. **Fossil Lot 389** was collected from the marine fossils and according to Tilton contained crinoid stems, branching bryozoa, **Productella lachrymosa, Dalmanella** sp., **Camarotoechia** sp., **Spirifer** sp., **Pterinea nodocosta, Sphenotus contractus, Cypricardinia elegans,** and **Orthoceras** sp. **Fossil Lot 390** was collected from the plant material and is in storage at Morgantown.

In **Valley Bend District** there is a visible exposure of 30 feet at elevation 2440′ B. on the east side of Right Fork of Mill Creek 1.5 miles northwest of Valley Bend, with plant stems and with marine fossils, including **Spirifer disjunctus, Camarotoechia,** crinoids, and pelecypods. In **Huttonsville District** it may be observed along the Staunton and Parkersburg Pike on the north side of Riffle Creek 0.5 mile northwest of Riffle Creek School. Here it is about 100 feet thick, with rather numerous tree fossils the largest of which measured 4′ 0″ through its long diameter, being greatly flattened in the other direction. The exposure also contains marine fossils.

In **Mingo District** some very interesting material was excavated by road contractors in a cut through a low ridge along the Seneca Trail on the west side of Tygart River between Elkwater Fork and Spangler. Here the visible exposure consists of about 50 feet of gray or dove-colored sandstone and mudstone, dipping westward and containing abundant plant remains and marine fossils. No large trunks were found but some of the small, freshly excavated stems exhibited leaf-scars and cell structure. **Fossil Lot 438** was collected and is now in storage. Some of the specimens, to the writer, are highly suggestive of **Cruziana** and others may be allied to **Protolepidodendron. Fossil Lot 437** was collected from the marine fossils and, according to Dr. Tilton, contained crinoid stems, **Batostomella** sp., **Schuchertella chemungensis, Productella lachrymosa, Dalmanella** sp., **Camarotoechia contracta, Camarotoechia eximia, Spirifer disjunctus, Spirifer mesacostalis, Ambocoelia umbonata, Pterinea** sp., **Leptodesma elongata,** and **Cypricardella** sp. His further comment on the collection will be found in Chapter XV.

The type locality of the Valley Head Sandstone, as recorded in the Valley Head Section, page 174, is at the village of the same name, the outcrops of the various ledges being just west of the axis of the Deer Park Anticline, starting near the church at the eastern edge of the town and extending westward across Tygart River to the heavy cut in the State road just west of the bridge. Immediately north of the town one reef of the sandstone makes a sharp ridge and just to the south and just east of the school, some of the beds are visible in the old highway cut where they exhibit quartz pebbles. Tree trunks are visible along the county road which turns northward at the church. When first examined the largest specimen projecting from the cut measured 4′ 0″ in long diameter and 12½″ in short diameter, being illustrated in Plates LXV and LXVI. Since field work was completed this specimen has been entirely destroyed by road workmen. **Fossil Lot 374** was collected from this locality by Dr. David White and the writer and is now in storage at Morgantown. One of the specimens of this collection consists of an approximate quarter-section of a large trunk on the surface of which carbonized, anastomosing strands are numerous.

In Tucker County a very good view of the Valley Head Sandstone is afforded on the north side of Dry Fork just east of Roaring Run one-half mile northwest of Hambleton, as recorded in the Roaring Run Section, pages 195-6. Here the visible exposure above the bed of the run is about 50 feet thick, consisting of sandstone, shale, and conglomerate, with many carbonized plant stems and with literally hundreds of fucoidal impressions. **Fossil Lot 399** was collected by Dr. David White and the writer and was shipped to Washington.

Middle (Chemung) Shales.

As indicated in the general section, pages 362-3, the shales and thin sandstones coming between the Valley Head and Elkins Sandstones are 650 to 750 feet thick, consisting of alternate beds of olive-green shales and thin flagstones or mudstones. They are well exhibited in the Beverly Section, pages 157-8, as exposed along the Staunton and Parkersburg Pike on the eastern slope of Rich Mountain. Here this stage contains two considerable sandstones, one of which is 60 feet thick, coming at 888 to 948 feet below the top of the Chemung, and containing numerous marine fossils. **Fossil Lot 362** was collected from it and according to Dr. Tilton contained crinoid stems, branching bryozoa, **Schuchertella chemungensis, Productella lachrymosa, Camarotoechia eximia, Spirifer disjunctus, Spirifer mesacostalis,** and **Liopteria bigsbyi.** In his additional comment which appears in Chapter XV he states that the horizon is essentially that of **Schuchertella chemungensis.**

In the same section another sandstone of the same group occurs at 1089 to 1114 feet below the top of the Chemung, with a thickness of 25 feet and with abundant marine fossils. Here **Fossil Lot 363** was collected and, according to Dr. Tilton, contained crinoid stems, branching bryozoa, **Productella**

lachrymosa, Spirifer mesacostalis, Ambocoelia umbonata, Leptodesma medon, and pelecypods. His further comment on the collection appears in Chapter XV.

Elkins Sandstone.

The **Elkins Sandstone** of Reger[7] is an assemblage of greenish-brown or mud-colored, iron-stained flagstones or thicker beds, comprising 450 to 500 feet of noticeably arenaceous material which usually makes a ragged, projecting outcrop in highway cuts and other favorable localities. Generally the combined color effect is decidedly more drab, or muddy, than the remainder of the Chemung, the difference being sufficiently great to aid in identification. These beds are mid-Chemung, the top being slightly above, and the base slightly below, the middle of the series. They are distinguished by the presence of the silicified trunks of many fossil trees some of which are of huge size, being mostly flattened by the weight of overlying beds. Diameters of four and five feet are not uncommon and some are even considerably greater. There is little or no evidence, however, for belief that these trees were indigenous, as stumps are comparatively rare and have not been found in upright position. Presumably the forest grew at some locality to the southeast, possibly in the present territory of Virginia, and drifted to the Randolph and adjacent areas on the flood waters of ancient rivers, finally becoming water-logged and mired into the muds of the sea bottom.

Marine fossils are also very abundant throughout the formation, some of the most common forms being **Atrypa hystrix, Atrypa spinosa, Schuchertella chemungensis, Douvillina cayuta, Schizophoria striatula, Pterinea chemungensis,** and a branching bryozoa which has not yet been identified but which bears such a striking resemblance to the twigs of a modern club-moss that it may readily be mistaken for a plant fossil.

The type locality of the Elkins Sandstone is in the deep cut of the State road on the north side of Tygart River 0.6 mile northwest of Buxton and 2.5 miles northwest of Elkins. Here, as shown in the Aggregates Section, pages 152-3, the thickness is 450 feet, there being a northwest dip of about 40° so that the beds are quickly exposed. Marine fossils are abundant throughout the sandier portions. **Fossil Lot 350** was collected in the upper 400 feet and, according to Dr. Tilton, contained **Schuchertella chemungensis, Camarotoechia eximia, Atrypa spinosa, Spirifer disjunctus, Spirifer mesastrialis,**

[7]Ibid., pp. 49-57.

Leptodesma medon?, and **Cypricardella**?. **Fossil Lot 351** was collected from an old quarry, above the road slightly farther east and in the lower 50 feet of the formation and, according to Dr. Tilton, contained **Douvillina cayuta, Productella lachrymosa, Productella** sp., **Schizophoria striatula, Atrypa spinosa, Spirifer disjunctus,** and **Tentaculites** sp. Both of these collections receive further comment from him in Chapter XV.

At this locality the broken blocks of sandstone exhibit the macerated remnants of many plants and in the highway cut itself the trunks of several large trees protrude, as shown by Plates LVIII, LIX, and LX. Most, but not all, of these trunks are much flattened. The largest observed measured 10 feet 6 inches, in long diameter and 16 inches the other way, and just above it is another measuring about six feet, while a single log which is still round is about three feet. Leaf-scars and cortical markings are very rare and no foliage has yet been identified. **Fossil Lots 396** and **397** were collected by Dr. David White and the writer and were shipped to Washington, certain additional specimens being in Morgantown.

In **New Interest District** the Elkins Sandstone was identified on Saltlick Run 1.5 miles northwest of Montrose, where it contains **Atrypa hystrix, Schizophoria,** bryozoa, and other marine fossils. It is also visible in the road north of Clifton Run of Shavers Fork, two miles above the mouth of the run, at elevation 2270′ B., containing **Atrypa hystrix, Spirifer,** and other fossils. In **Leadsville District,** in addition to the type locality already described, it may be observed on Laurel Ridge along the old Morgantown Pike between elevations 2155 and 2250′ B., about 2.3 miles northwest of Gilman. Here it contains **Atrypa hystrix** and **Atrypa reticularis**?. On the Craven Run road 2.5 to 3.0 miles northeast of Elkins, it is again visible, containing both marine and plant fossils but rather too poorly exposed for good lithologic observation. Here **Fossil Lot 354** was collected from the marine fossils, reported by Dr. Tilton as containing impressions of wood, crinoid stems, **Fenestella** sp., **Leptostrophia perplana** var. **nervosa, Douvillina cayuta, Productella lachrymosa, Atrypa spinosa, Spirifer disjunctus, Pterinea chemungensis,** and **Ectenodesma birostratum,** as will be later discussed by him in Chapter XV. Somewhat higher in the formation and farther up the run **Fossil Lot 367** was collected from rather abundant, macerated plant remains in the hope that foliage might be discovered but this has not been accomplished.

On Loglick Run the Elkins Sandstone, more probably the upper portion, was observed at elevation 2230′ B., about 2.7 miles east of Whyte Station. Here it contains **Atrypa** hystrix, **Atrypa reticularis?**, a huge **Spirifer**, **Pterinea chemungensis**, and **Fenestella**. On the Durbin Branch of the Western Maryland Railway 0.6 mile east of Canfield it is rather well exposed with a visible thickness of 100 feet or more, being greenish-brown or bluish-gray, and thick-bedded, with many streaks of shale and with a few calcareous zones, with numerous plant stems and with marine fossils, including **Atrypa hystrix** and one or two other species of the same genus, **Spirifer disjunctus**, **Schizophoria**, **Fenestella**, and some pelecypods noted as Pectens but probably **Pterinea** instead. Almost directly opposite this locality there is a fine exposure in the Elkins-Franklin road on the south side of a branch of Isner Creek just at the foot of Kelley Mountain. Here there is a visible thickness of 300 feet as recorded in the Kelley Mountain Section, page 155, there being abundant marine fossils and also plants. **Fossil Lot 365** was collected from the former and, according to Tilton, contained branching algae, **Zaphrentis chemungensis**, crinoid stems, **Fenestella** sp., branching bryozoa, encrusting bryozoa, **Schizophoria striatula**, **Leptostrophia perplana** var. **nervosa**, **Douvillina cayuta**, **Productella lachrymosa**, **Atrypa spinosa**, **Atrypa hystrix?**, **Spirifer disjunctus**, **Spirifer mesacostalis**, **Spirifer mesastrialis**, **Ambocoelia umbonata**, and **Pterinea chemungensis**. At this locality, also, the writer discovered two unmistakable tree stumps both of which are much flattened but have cortical markings on one side. The larger specimen has a diameter of 14 inches and shows the beginning of the root system. These stumps were found in a rubbish pile but from their flattened condition are rather considered as driftwood than as native to the locality. **Fossil Lot 366** was collected, the locality having been visited later and the collection amplified by Dr. David White. The two stumps described are now at Morgantown but part of the collection is in Washington.

At the Sylvanus Kyle Heirs Ore Prospect on Left Fork of Chenoweth Creek, 0.9 mile north of Hart School, at elevation 2305′ B., it is evident that the digging for lead was done in the Elkins Sandstone, judging by the strike of the rocks and as indicated by the presence of **Atrypa hystrix** and a colony of cup corals noted as **Zaphrentis**. On the main Chenoweth Creek 0.4 mile east of Hart School there is a fragmentary exposure of about 10 feet of the rock from which **Fossil Lot 359** was collected, having, according to Dr. Tilton, **Spirifer disjunctus** and **Atrypa hystrix**.

In **Beverly District** part of the Elkins Sandstone is exposed along the Staunton and Parkersburg Pike near the foot of Rich Mountain and slightly east of the point where a road turns southward up Beaver Creek, as recorded in the Beverly Section, page 158. Here, in the 75 feet of visible exposure, there is only a little plant material but marine fossils are characteristic and abundant. **Fossil Lot 364** was collected and, according to Tilton, contained crinoid stems, **Fenestella** sp., branching bryozoa, **Schizophoria striatula, Leptostrophia perplana** var. **nervosa, Douvillina cayuta, Productella lachrymosa, Atrypa hystrix, Spirifer disjunctus,** and **Pterinea chemungensis,** as will be discussed by him in Chapter XV.

On Left Fork of Files Creek 3.3 miles southeast of Beverly, the Elkins Sandstone was noted where the highway bridge crosses the creek, the visible exposure being only 10 to 15 feet thick but containing **Atrypa hystrix, Spirifer disjunctus,** and other marine fossils, in addition to plant stems.

In **Valley Bend District** there is a 20-foot exposure on Ward Run 3.2 miles southeast of Valley Bend at elevation 2540′ B., with **Atrypa hystrix, Schizophoria, Spirifer,** and crinoids. On Shavers Run 1.2 miles southeast of Shavers Run School it was again noted at elevation 2265′ B., with plant fragments and **Atrypa hystrix.** On the opposite side of Tygart Valley there is a very good exposure on the hill road just west of the Seneca Trail and 1.1 miles northwest of Valley Bend. Here the base of the formation is at elevation 2385′ B. and its top at 2460′ B., with a westward dip of 43° and a computed thickness of 495 feet. The rock is mostly greenish-brown, partly thick-bedded and partly flaggy with numerous streaks of shale. Plant fragments are abundant in the lower 50 feet and again toward the top and about 150 feet above the base is the marine fossil zone containing **Atrypa hystrix, Atrypa reticularis?, Schuchertella, Ambocoelia,** crinoids, and possibly other forms.

In **Huttonsville District** the Elkins Sandstone is visible in the cut of the Seneca Trail just west of Tygart River and one-third mile south of Lee Bell. Here there is a local structural wrinkle, the dip being eastward at an angle of 50°. The rock is mud-colored and contains **Atrypa hystrix, Schuchertella, Ambocoelia, Tropidoleptus carinatus?,** and other marine fossils, and also carries rather abundant and interesting plant debris. **Fossil Lot 413** was collected from this material by Dr. David White and the writer and was shipped to Washington. On Becky Creek its apparent outcrop is 1.5 miles southeast of Lee Bell School, **Pterinea chemungensis** being noted in a large boulder. Just off the Staunton and Parkersburg Pike it makes ledges on the western side of Laurel Run of Riffle Creek three miles southeast of Huttonsville, containing **Atrypa hystrix, Atrypa reticularis?, Spirifer,** and crinoids. On the same highway in Pocahontas County 0.5 mile east of Durbin it was noted by Dr. David White, Paul H. Price, and the writer, being about 300 feet thick, brown, ferruginous, partly thick-bedded and partly shaly, and interbedded with shale, and containing numerous tree fragments including one specimen five feet in diameter as shown in Plate LXVIII. **Fossil Lot 426** was collected from some of the smaller fragments.

In **Mingo District** a very good exposure of the Elkins Sandstone is visible on the east side of Tygart River in the cut of the Valley River Railroad between Spangler and the mouth of Stewart Run. Here the approximate base of the formation is uncovered in the cut of the State road at the railroad crossing immediately south of Spangler and the outcrop extends northward for 2500 feet in a series of ledges, the dip being westward at an angle of 20° and the computed thickness 500 feet. The rocks are partly greenish-brown and partly mud-colored, partly thick-bedded and partly flaggy, with occasional beds of shale. Plates LXI-LXIV, inclusive, show four views of this locality. Some of these ledges carry abundant marine fossils from which **Fossil Lot 373** was collected by the writer, containing, according to Dr. Tilton, **Zaphrentis chemungensis,** concentric sponge?, **Schizophoria striatula, Douvillina cayuta, Productella lachrymosa, Atrypa spinosa, Spirifer disjunctus, Ambocoelia umbonata, Palaeoneilo angusta?, Pterinea nodocosta, Pterinea chemungensis, Ectenodesma birostratum,** and **Leptodesma** sp., as further discussed by him in Chapter XV. Numerous specimens of **Atrypa hystrix** were also noted by the writer but apparently failed to get into the collection.

Along this outcrop there are numerous silicified tree trunks, some of which show external markings but give no hint of internal cell structure, as this has been entirely replaced by sand and mud in which there are marine fossils. A very striking and recurrent phenomenon at this locality, and also at other places, is a stem which carries on one side a narrow, longitudinal depression occupying about one-fourth the circumference and having faint longitudinal grooves, while the remainder of the circumference exhibits a series of heavy cross ridges or crenulations. These may be best observed in small specimens of a few inches diameter but are by no means absent on many of the larger stems. Some of the small specimens, also, exhibit a thick, stubby end, like the branch of a tree-cactus.

Practicallly all of the undisturbed stems in this cut lie parallel to the bedding-planes of the strata, being partly bedded in the sandstones and partly in the shales, and being visible partly in longitudinal view and partly in cross-section. One huge log, which is almost round and about three feet in diameter, as shown in Plate LVIII, measured approximately 12 feet in length, its further extensions having been destroyed in making the cut. A part of this specimen was recovered and is now in Morgantown. Another, exhibited in cross-section in Plate LXII, is elliptical, measuring 26 inches by 16½ inches in diameter.

Fossil Lot 388 was collected at this locality by Dr. David White and the writer with the most cordial assistance from Mr. M. N. Wilson, President, and Mr. J. S. Hamill, General Manager, of the Valley River Railroad, who furnished a flat car and crew of men and transported the load to the Western Maryland Station at Mill Creek. With their help several tons of very interesting specimens were secured and are now in Morgantown.

In **Dry Fork District** the Elkins Sandstone is partly exposed at the summit of the Blackwater Anticline one-half mile west of Wymer, with a characteristic fauna as detailed in the Evenwood Section, page 194.

In **Tucker County** the Elkins Sandstone was traced northeastward to Parsons. On the north side of the Pheasant Run road, 3.8 miles northeast of Kerens, it outcrops at elevation 1880′ B., being greenish-brown and shaly with a visible thickness of 100 feet and containing numerous large pieces of silicified tree stems, the largest of which has a long diameter of 4′ 0″ and a short diameter of 1′ 7″. **Fossil Lot 394** was collected from some of the smaller specimens. The marine fauna at this locality included **Atrypa hystrix, Atrypa reticularis?, Schizophoria?, Douvillina?,** and other forms. On the west side of Shavers Fork just north of Pheasant Run there is a good exposure of part of the sandstone in the public road at elevation 1745′ B., with a visible thickness of 25 feet. Here it is greenish-brown and quite massive with numerous marine fossils, including **Atrypa hystrix, Pterinea chemungensis?,** and other species, and with a bewildering display of twisted and gnarly tree fragments one of which measured 5′ 0″ in diameter. **Fossil Lot 402** was collected by Dr. David White and the writer and was shipped to Washington. Other exposures occur along the same road between Pheasant Run and Porterwood but were not examined in detail. In the State road on the north side of Haddix Run 0.3 mile west of Porterwood it is rather well exposed with a few marine fossils and also tree fragments, the length of the outcrop along the highway being about 1100 feet with a southeast dip of 15°.

At the Alum Hill cut where the highway goes across a low saddle west of Cheat River, one mile north of Parsons, a surface of the Elkins Sandstone is exposed at elevation 1725′ B., dipping southeastward at an angle of 40°. Here the rock is greenish-brown and shaly, with many joint-planes and with abundant **Atrypa hystrix.** On its face is the depressed impression of a slender stem measuring two inches in diameter and 15 feet in visible length and extending obliquely across the joint-plane pattern. Apparently all vestiges of the original woody content had long ago been destroyed and the mold had been refilled with fossiliferous sand which is now partly dislodged. Some slight cross markings, however, give a suggestion of nodes. **Fossil Lot 401** was collected by Dr. David White and the writer from some of the filled interior and was shipped to Washington.

Near the Moss Bridge about two miles north of Parsons the outcrop of the formation was noted at elevation 1630′ B. in two trails just east of Cheat River and slightly above the bridge level, with fragments of trees. At the eastern end of Parsons where the highway bridge spans Dry Fork of Cheat there is a good exposure on the east side of the fork and just north of the bridge, extending down to water-level. Here the rock is greenish-brown, thick-bedded, and hard, dipping southeastward at an angle of 13° and containing marine fossils, including **Atrypa hystrix, Atrypa reticularis?, Douvillina?, Schizophoria?, Pterinea chemungensis,** and other species. Some rather large stems of trees occur in this outcrop just north of the bridge and also in a reddish-brown ledge along the road about 300 feet east of the bridge, considered to be part of the same formation. **Fossil Lot 395** was collected from some of the fragments just north of the bridge.

In **Preston County** the Rowlesburg Section of Hennen and Reger, published on pages 97-101 of the Preston County Report of the Survey, records plant fossils in the Rowlesburg Sandstone about 800 feet below the top of the Chemung. This locality was examined recently by the writer and Paul H. Price and **Fossil Lot 462** was collected from these stems. It is quite possible that this ledge represents the Elkins Sandstone.

Quite recently the stems of plants have been noted in the Chemung outcrop along the highway south of North Branch of Potomac River slightly west of Keyser, **Mineral County,** apparently in both the Elkins and Valley Head horizons, although no careful determination has been made. South of Randolph County various outcrops of the Elkins Sandstone with the same tree trunk fragments have been noted by Price[8] as extending through Pocahontas County, West Virginia, into Highland County, Virginia. It is evident, therefore, that the known occurrence of these plants covers a range of about 100 miles in a northeast-southwest direction. On the other hand the known width of this belt in a southeast-northwest direction is only a comparatively few miles, as the beds soon go under drainage to the northwestward while to the southeastward no search for the trees has been made.

Lower (Chemung) Shales.

The Lower Shales of the Chemung, comprising that portion of the series below the Elkins Sandstone and having a thickness of 1025 to 1250 feet, as exhibited in the general section, page 363, consist partly of olive-green, sandy shales and thin, fine-grained flagstones of the same color, there being occasional ferruginous and slightly calcareous zones which contain abundant marine fossils. In **New Interest District** the nature and contents of the extreme lower part of these shales are well illustrated at the following exposure:

Local Measurement at Fossil Lot 357.

New Interest District; in Western Maryland Railway cut on headwaters of Leading Creek, 1.5 miles northeast of Montrose; dip, southeast, 36°; arrangement in descending stratigraphic order.

	Thickness. Feet.	Total. Feet.
Chemung Series (50′+)		
1. Sandstone and shale, greenish-brown, in alternating layers, with a few calcareous streaks; marine fossils abundant. **Lot 357**; contains plant impressions (fucoids?), crinoid stems, **Chonetes scitulus**? and **Ambocoelia umbonata** (very abundant), according to Tilton	50	50
Portage Series (100′+)		
2. Shale, dark-gray, with thin streaks of sandstone	100	150

In **Leadsville District**, on Loglick Run of Leading Creek 1.9 miles east of Whyte Station, **Fossil Lot 358** was collected from loose boulders weathered from beds estimated as about 700 feet above the base of the Chemung and most certainly several hundred feet below the Elkins Sandstone which outcrops a mile farther east up the run. According to Dr. Tilton the fauna consists of crinoid stems, **Dalmanella tioga, Douvillina cayuta, Schuchertella chemungensis, Camarotoe-**

[8]Paul H. Price, Pocahontas Rept., W. Va. Geol. Survey, pp. 212, 214; 1929.

chia contracta, Spirifer mesacostalis, Ambocoelia umbonata, and Tentaculites sp., as further discussed by him in Chapter XV. It is worthy of note that Dalmanella tioga has been found only in beds below the Elkins Sandstone in the county.

In the Aggregates Section, page 153, these lower beds are noted as 1520 feet thick, but poorly exposed, along the State road about two miles northwest of Elkins, Ambocoelia being noted in the upper half.

These lower beds may be observed to good advantage along the Durbin Branch of the Western Maryland Railway starting at the Portage-Chemung contact just east of the highway underpass 0.6 mile southwest of Canfield and continuing to the base of the Elkins Sandstone about 0.5 mile southeast of Canfield. At the former locality there are numerous crinoids, Camarotoechia and Ambocoelia, there being one streak of limestone, three to five inches thick, which is a mere mass of the latter fossil. Some of these railroad cuts exhibit trail markings.

In Beverly District the Beverly Section, page 158, records these beds as 965 feet thick along the Staunton and Parkersburg Pike at the base of Rich Mountain and eastward along Beaver Creek, with Spirifer, Schuchertella, and Camarotoechia near the middle and with Ambocoelia and crinoid stems near the base.

ECONOMIC ASPECTS, CHEMUNG SERIES.

The Chemung Series of Randolph County is mainly of scientific interest, and as such will become a classic locality for the study of its interesting plant and marine fossils. As an economic factor it is exceptionally barren of known mineral products. Some of its sandstone ledges could be used to a limited extent for building purposes, although they would probably suffer disastrously from the competition of better material. Its flagstones would have a limited use for walks where odd or decorative effects are desired. Generally its shales are either too sandy or contain too many lenses of actual sandstone to be of much interest for brick making, although they could probably be used to a limited extent. When weathered the Chemung makes a very thin soil, incapable of producing good pastures or good agricultural crops without a prohibitive expenditure for fertilizer.

PORTAGE SERIES.

GENERAL ACCOUNT, PORTAGE SERIES.

The Portage Series, coming next below the Chemung, is an assemblage of greenish-gray flagstones and greenish-gray or dark, sandy shales, alternating throughout. The flagstones, generally, are seldom more than a few inches thick, with occasional slightly larger lenses. In some localities the shales have greater thickness, there being occasional beds of 15 to 20 feet practically free from sandstone. Frequently there are large ovoid concretions of sandy material, some of which are five or six feet in diameter, a conspicuous instance of which may be observed in the highway cut of the Seneca Trail just north of Beverly. The occurrence of these concretions may be due to some slight content of calcareous or ferruginous matter both of which have a decided tendency toward segregation into such forms when present in a matrix that is predominantly sandy. The thickness of the series is apparently 2000 to 2500 feet, although accurate measurement is impossible at any point in the county on account of the incompetent nature of the strata which are almost invariably wrinkled into small folds or overturns or weathered too much for determination of dip. Ripple-marks and mud-cracks on the flagstones are fairly common.

Marine invertebrate fossils are extremely rare, there being occasional specimens of **Productella lachrymosa** and some unidentified pelecypods. A more patient search might reveal additional species, as the Portage elsewhere sometimes contains a more varied fauna. Trail markings of little understood character, however, are common and the macerated remains of plants and the stems of small, silicified trees are quite abundant.

SUBDIVISIONS, PORTAGE SERIES.

In Maryland, where the Portage contains certain lithologic differences and a very considerable marine fauna, Swartz[9] defines the following subdivisions in descending stratigraphic order:

Parkhead Sandstone Member. Recurrent **Tropidoleptus carinatus** fauna.
- Shale beds.
- Conglomeratic sandstone beds.
  - **Cyclonemina multistriata** zone.
  - **Camarotoechia congregata** var. **parkheadensis** zone.
  - **Liorhynchus mesacostale** zone.

Woodmont Shale Member.
- Beds containing Ithaca fauna (**Spirifer mucronatus** var. **posterus** fauna).
  - **Liorhynchus globuliforme** zone.
  - **Cladochonus—Reticularia laevis** zone.
- Beds containing the Naples fauna (**Buchiola speciosa** fauna).

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[9]Chas. K. Swartz, Middle and Upper Devonian, Maryland Geol. Survey, p. 411; 1913.

There appears to be no possibility of applying this very clear subdivision to Randolph County because of the absence of lithologic and faunal differences. The classification is introduced, however, to facilitate a subsequent discussion of fossil plants.

TOPOGRAPHIC EXPRESSION, PORTAGE SERIES.

The Portage of the county invariably exhibits a succession of low ridges, some of which are fairly sharp and others of which are gently rounded, the entire terrane being cut into an intricate pattern by numerous small streams. As previously stated these ridges are much lower and much less sharply defined than those of the Chemung.

AREAL EXTENT, PORTAGE SERIES.

Figure 13 shows the Portage outcrop of the county and on Map II its areal extent may be studied in more detail. There is only one area, this being along the axis of the Deer Park Anticline starting at the head of Leading Creek and extending southward in the valley of this creek to Elkins and thence southward through Tygart Valley to Stewart Run near Spangler and embracing parts of **New Interest, Leadsville, Beverly, Valley Bend, Huttonsville,** and **Mingo Districts.** In the Leading Creek Valley, however, there are two areas of Genesee which locally divide the Portage into two limbs. This extensive area of Portage is fully 35 miles long and toward the north is four miles or more in width.

CONTACTS, PORTAGE SERIES.

The upper contact of the Portage with the overlying Chemung has already been discussed on page 364. Here there is a slight lithologic change from the more shaly and grayish-green beds of the Portage to the somewhat heavier, olive-green strata of the Chemung, and also the Chemung fossils suddenly appear, and the topography is bolder. At the base of the Portage the contact with the underlying Genesee is much more easily recognized, the Genesee being composed of fissile shale which is almost black and which is quite devoid of flagstones. There is also a faunal difference, as the Genesee contains rather abundant specimens of **Buchiola retrostriata** and **Styliolina fissurella.**

FOSSIL LIFE, PORTAGE SERIES.

The scarcity of marine fossils in the Portage has already been mentioned, **Productella lachrymosa** being the only

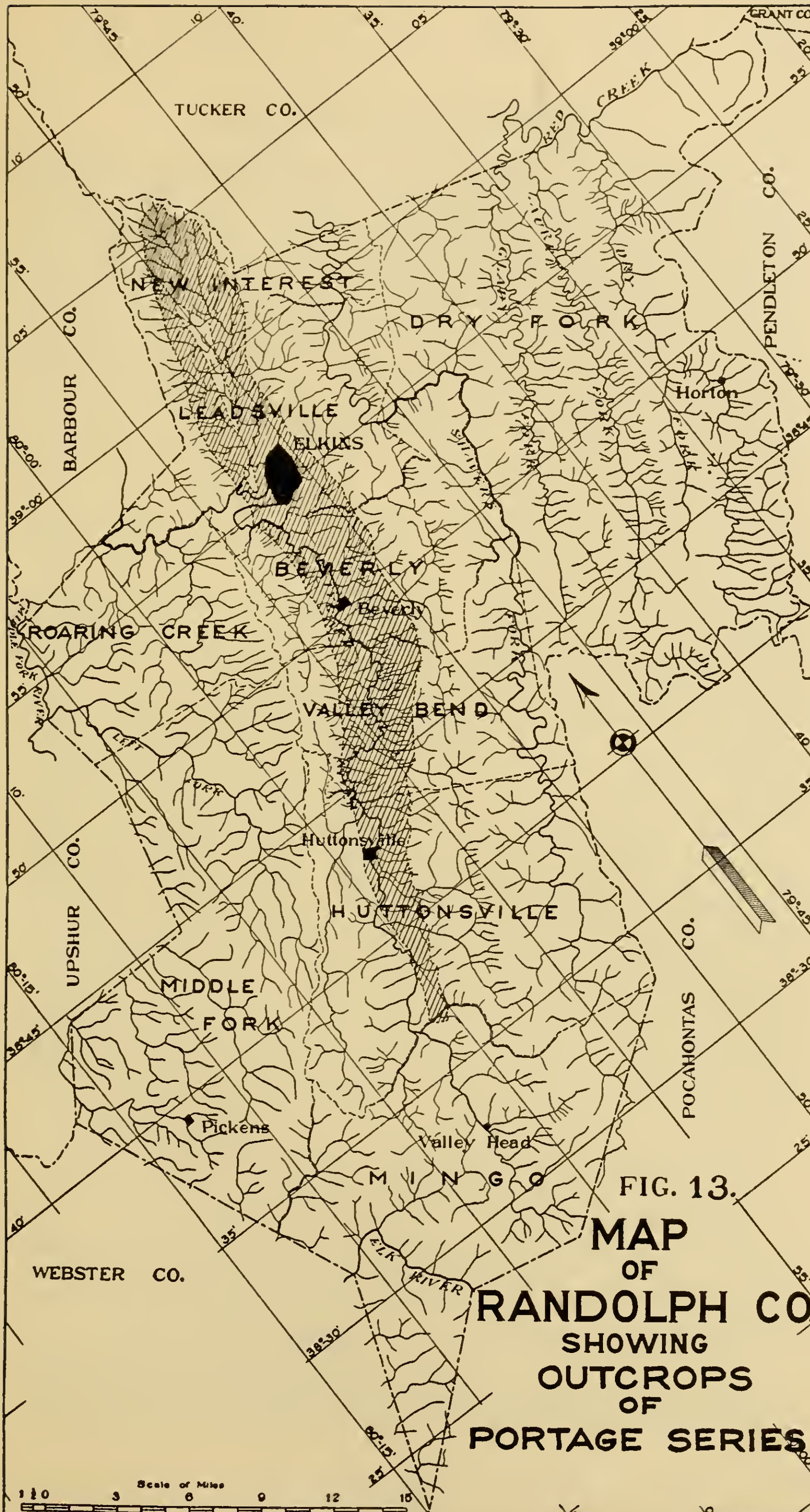

FIG. 13.

MAP OF RANDOLPH CO. SHOWING OUTCROPS OF PORTAGE SERIES bivalve noted by Dr. Tilton in the collections of the writer, while certain pelecypod fragments too poor for examination were observed but not submitted to him. On many of the flagstones and mudstones of the series, however, there are numerous impressions that are apparently trail markings of some sort. Time did not permit a serious attempt to collect these forms but at some localities the writer observed a distinct trail having the appearance of Pteridichnites biseriatus which has been identified in the Woodmont member of the Portage of Maryland and which is reported as similar to tracks that occur with some abundance in the Naples formation of New York.

In contrast to the practical absence of bivalves the Portage of Randolph County, more especially its lower portion, contains an abundance of the macerated branches and roots of plants, many of which are sufficiently carbonized to appear in good relief on the surface of freshly split slabs of sandstone or mudstone. Various collections of these slabs were made by the writer in the hope that foliage, fruit, or other distinguishing marks might be revealed and in this quest, which has not yet proved successful, he had for a brief period the able assistance of Dr. David White with whom several of the collections have been filed at Washington. At some localities, also, there are small silicified stems of trees, most of which are only half-sections and the largest of which is hardly eight inches in diameter. On most of these stems there are rough cortical markings with occasional suggestions of leaf-scars. Practically all of these stems were found in pasture fields entirely weathered out from the matrix so that observation on their original occurrence in the strata was not obtained. There is, of course, a faint possibility that they may be residual from the Chemung which once covered the localities but in general they have only slight resemblance to the stems which commonly occur in the Chemung. Their original position in the lower half of the Portage is also to be inferred from the abundance of small branches and rootlets which occur at that stage.

No evidence that these trees actually grew in the localities of their present occurrence has been found. On the contrary the absence of stumps and the fact that the trunks are always eroded to half-section or less would indicate that considerable transportation may have taken place, as has been postulated in the case of the Chemung trees of the same region.

The proper identification of these ancient trees is not herein attempted, as it has been expected that Dr. David White, who has some of the specimens and who has briefly inspected some of the others, will eventually find time to give them detailed study. In some respects, however, they have some resemblance to **Eospermatopteris**, as described in New York State by Miss Goldring[10], and their identification with this or some allied form would not be surprising, as the Gilboa Forest of New York is described as occurring in beds of Ithaca age which is about the stage of the Portage trees of Randolph County.

CORRELATION, PORTAGE SERIES.

From the Parkhead and Woodmont faunas of Maryland it is quite evident that these two formations correlate in large part with the original Portage of New York State. From Maryland the Parkhead and Woodmont have both been traced across the Potomac into the Eastern Panhandle of West Virginia, with their typical faunas. Westward in Maryland it is stated that the heavier sandstones of the Parkhead turn to shale and that the faunas of the Parkhead and Woodmont largely disappear. It is not surprising, therefore, that the same conditions found in western Maryland prevail farther southwest, as is the case in Mineral, Grant, Hampshire, Hardy, and Pendleton Counties. The same absence of heavy sandstone and the same scarcity of marine faunas in Randolph County are in harmony with the observed trend in western Maryland and the Potomac counties of West Virginia. On faunal grounds the beds herein described as Portage could scarcely be proved or disproved but on stratigraphic position, between the overlying Chemung and the underlying Genesee, their reference to the Portage is quite in order. The further facts that Maryland exhibits practically the full New York column of Portage, and that the beds have been directly traced from Maryland to West Virginia are sufficient evidence for belief in the practical identity of the Randolph County Portage with that of New York State.

DESCRIPTION OF MEMBERS, PORTAGE SERIES.

It has previously been stated that subdivision of the Portage into members has been impractical owing to the lack of essential lithologic and faunal differences throughout the series. Certain outcrops, however, are worthy of attention.

In **New Interest District** the following section of an imperfect exposure was measured:

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[10] Winifred Goldring, The Upper Devonian Forest of Seed Ferns in Eastern New York, N. Y. State Mus., Bull. No. 251, pp. 50-92; 1924.

Tar Run Section.

New Interest District; on Tar Run of Stonespring Run of Leading Creek, starting at the Portage-Chemung contact 2.6 miles northwest of Kerens and extending southeastward down the run 0.9 mile; measured by pacing and computation of vertical angles by David B. Reger; arrangement in descending stratigraphic order; dip, northwestward, varying from 20 to 70° with some slight reversals.

	Thickness. Feet.	Total. Feet.
1. Sandstone, green, flaggy, with marine fossils, **Ambocoelia umbonata, Spirifer mesacostalis, Spirifer disjunctus**, crinoids; base of **Chemung Series** (2065′ B.), not measured	--	--
Protage Series (2785′)		
2. Shale, greenish-gray, with thin flagstones, and with a few plant fossils at base	340	340
3. Shale, dark-gray, with thin, flaggy sandstones	320	660
4. Concealed, with shale and flagstones	1000	1660
5. Concealed, mostly, with greenish-gray, flaggy sandstone; includes a slight reversal of dip	685	2345
6. Concealed, with green sandstone	430	2775
7. Sandstone, greenish-gray, hard, flaggy, with small plant branches; visible thickness (1970′ B.)	10	2785
8. Shale, dark, fissile, **Genesee Series**; contact is just west of mouth of Tar Run	--	----

In the above section it is evident that the occurrence of plants begins practically at the base of the Portage but it is unfortunate that their upward range through Nos. 5 and 4 of the section is concealed by poor exposures.

In the same district a good exposure of the middle portion of the Portage is exhibited in a heavy cut along the State road on the east side of Leading Creek one-third mile south of Kerens consisting of greenish-gray sandstone and shale of the same color. Here there are fossil plant fragments, a few bivalves and annelids, with numerous trail markings among which **Pteridichnites biseriatus** was noted. **Fossil Lot 393** was collected but has not been studied in detail.

In **Leadsville District** the half-sections of small tree trunks, 0′ 4″ to 0′ 8″ in diameter were found scattered along a small ravine of Leading Creek near some old ocher diggings 0.3 mile east of Read Station and two miles north of Elkins, together with some fragments of sandstone containing marine fossils. **Fossil Lot 369** from the fossil trees, and **Lot 370** from the marine fossils were collected by the writer and J. B. Ward, Jr., of Beverly, the locality being visited later by Dr. David White who secured additional specimens of tree trunks. Dr. Tilton, who examined **Lot 370,** reports the presence of **Productella lachrymosa,** as later discussed by him in Chapter XV. Some of the small tree trunks are now in Washington and others in Morgantown. At this locality bedded rocks are not exposed, the collections being made from stone piles and debris along the gentle ravine but the Chemung contact is approximately three-fourths mile farther east and, as the eastward dip is considerable, the horizon should be in the lower half of the Portage. According to Dr. Tilton, however, **Productella lachrymosa,** which ranges through a considerable part of the Chemung, is reported only from the upper portion of the Portage. It is of course possible that the small boulder in which this fossil occurs may have been transported a considerable distance down the ravine from a higher stratigraphic horizon.

On Sugar Run of Leading Creek one mile northeast of Read Station and on the same line of strike as the locality above described, Dr. White and the writer collected **Fossil Lot 398** from similar half-sections of small trees which were likewise scattered along the bed of the run without attachment to the matrix. This collection was shipped to Washington.

At the fork of the road where the old Morgantown Pike intersects the Elkins-Parsons State road just east of Claylick Run and 0.9 mile southwest of Read Station a greenish-gray sandstone in the lower portion of the Portage was once quarried and used for road metal along the Morgantown Pike. This locality is only one-third mile east of the axis of the Deer Park Anticline which is barely covered by Portage and hence the exposure could hardly be more than a few hundred feet above the base of the Portage, being somewhat difficult of determination on account of a sharp upward flexure which locally occurs at the quarry. The stone is hard and flaggy with some shale beds, all of which were indiscriminately hauled to the pike, the result being a macadam which was far from standard but doubtless justified by low cost and immediate local benefits. In the quarry and for half a mile or more northward along the strike, which approximately follows the pike, there are numerous macerated and carbonized fragments of plants, all of which were considered too poor for collection.

In the cut of the Coal and Coke (B. & O.) Railway on the south side of Tygart River 0.5 mile southeast of Buxton and two miles west of Elkins and hardly one-fourth mile west of the Deer Park Anticline there is a considerable amount of plant material, including some partial sections of plants as much as six inches in diameter which appear to be thallophytes and quite different from the flora at Read Station. **Fossil Lot 392** was collected by the writer and shipped to Dr. David White at Washington. At this locality the trail of **Pteridichnites biseriatus** was noted.

In **Beverly District** there are many good Portage exposures near Beverly, including an exhibition of huge ovoid concretions along the Seneca Trail just north of the town, and including the cuts along the same highway southward toward Burnt Bridge. In some of these cuts the shales become quite dark and have often been mistaken for Genesee but they contain flagstones and are barren of any Genesee fossils.

In **Valley Bend District** these same dark shales of the Portage are well exhibited along the county road east of Tygart River and just south of Burnt Bridge, with a continuous exposure of about 400 feet of strata composed partly of sandstone flags and partly of dark-gray, chunky shales.

In the county road along the east side of Tygart River 1.2 miles southeast of Valley Bend and 0.6 mile southwest of Glade Run School there are numerous small carbonized and macerated plant stems in the lower half of the series, or apparently 1950 feet below the Portage-Chemung contact by a measurement made over poor exposures. Here **Fossil Lot 368** was collected by the writer, being further amplified by Dr. David White at a subsequent visit. Most of this material was shipped to Washington but, like various other collections of similar Portage material, may prove to be worthless.

In **Huttonsville District** a good, clean Portage-Chemung contact is visible in the cut of the Staunton and Parkersburg Pike on the north side of Riffle Creek 0.8 mile southeast of Channel School and 2.8 miles southeast of Huttonsville. Here the dip is southeastward at an angle of 26°, the Chemung being composed of thick-bedded, greenish-brown sandstone and shale of the same color, with marine fossils, including **Ambocoelia umbonata, Spirifer**, and a small cephalopod which may be **Orthoceras**; and the Portage being mostly dark-gray shale with thin sandstones and a few plant fragments.

In the county road on the east side of Tygart River 2.3 miles south of Lee Bell there is a lenticular streak of coal in the shales of the Portage at elevation 2135′ B., the deposit being only one-half inch thick and one foot long, but being interesting because of the possibility that it may have for deciphering cell structure in the ancient Portage woods.

ECONOMIC ASPECTS, PORTAGE SERIES.

The Portage Series offers little that is of present economic interest. Some of its flagstones would have a limited use for building walks and its more argillaceous shales would make building brick as is already being done at the plant of the Elkins Brick Company which will be described in Chapter XIII. Its shales weather to a soil which is not difficult to cultivate but which is too thin for good pasture and which requires heavy fertilization to produce crops.

GENESEE SERIES.

GENERAL ACCOUNT, GENESEE SERIES.

The Genesee Series, coming next beneath the Portage and comprising the lower division of the Upper Devonian, is visible and available for study in two camparatively small areas in the valley of Leading Creek, being a black, bituminous and fissile shale, with a thickness of 150 to 200 feet and with occasional marine fossils and plant spores.

SUBDIVISIONS, GENESEE SERIES.

The Genesee is not subdivided except that at the base there occurs the **Landes Limestone** of uncertain age but presumably transitional between the Genesee and Hamilton. For the sake of convenience this limestone, which is only about two feet thick, is herein described with the Genesee.

TOPOGRAPHIC EXPRESSION, GENESEE SERIES.

The topography of the Genesee, as exhibited along certain portions of the valley of Leading Creek, is very mild, being mostly eroded into small valleys with low and gentle intervening ridges.

AREAL EXTENT, GENESEE SERIES.

Figure 14 shows at a glance the outcrop of Genesee and on Map II its visible areas are exhibited in more detail. There are two localities, both of which are along the axis of the Deer Park Anticline in the valley of Leading Creek. The larger of these, partly in **New Interest** and partly in **Leadsville District**, is nearly six miles long and less than one mile wide, extending from Schoolcraft Run nearly to Claylick Run. The smaller, in **Leadsville District**, is little more than a mile long and less than one-half mile wide, located in the lower valley of Leading Creek northwest of Elkins. It is possible, also, that a portion of the immediate valley of Tygart River between Elkins and Beverly has been eroded into the Genesee along the axis of the arch but, if so, it

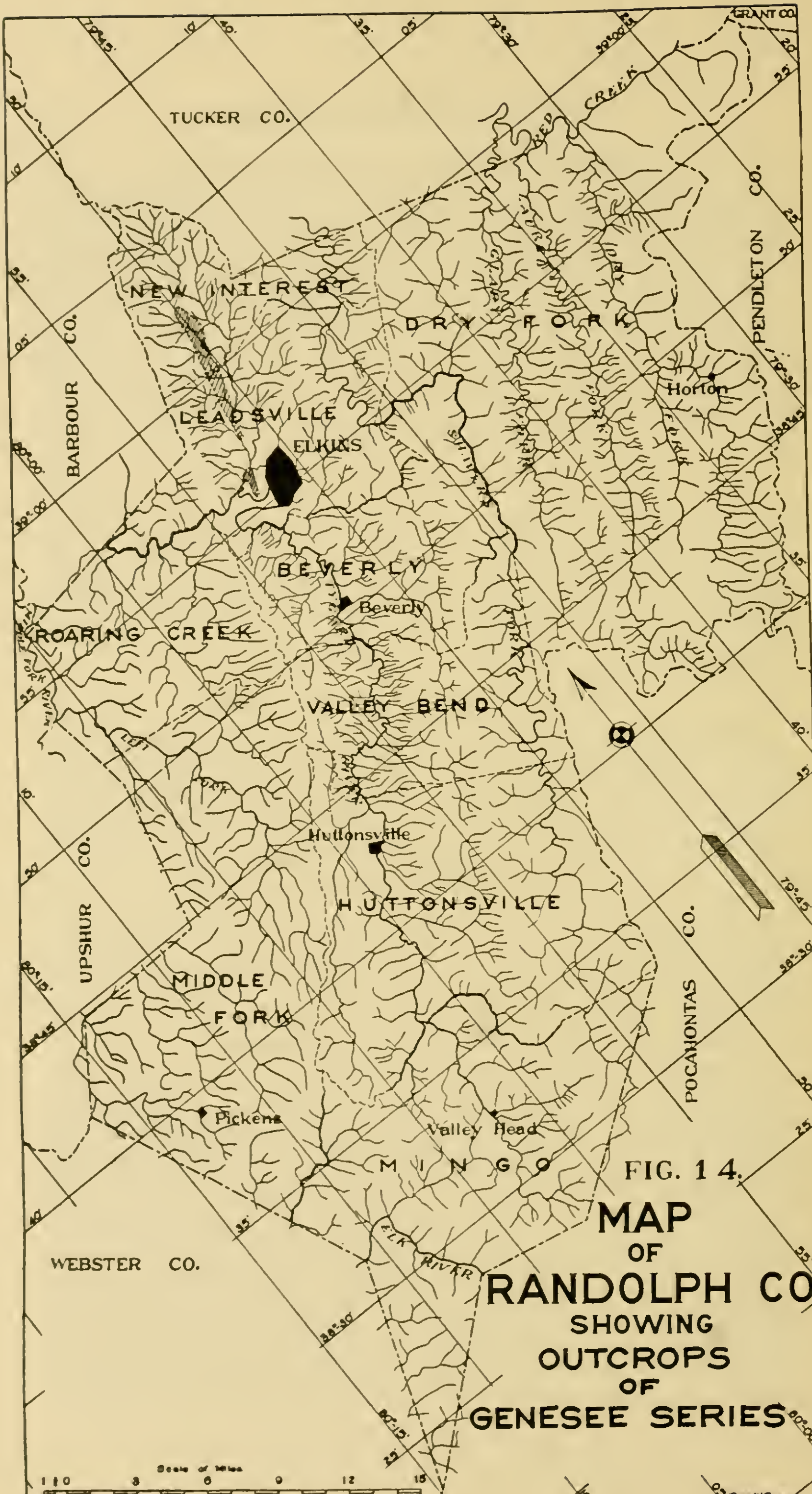

FIG. 14.

MAP OF RANDOLPH CO. SHOWING OUTCROPS OF GENESEE SERIES has been covered by alluvium, leaving no visible exposure of Genesee.

CONTACTS, GENESEE SERIES.

The upper contact of the Genesee with the Portage has already been discussed, page 384. Here the Portage flagstones and dark-gray shales rest on the black and fissile shales of the Genesee and the contact is easy to recognize. The lower contact with the Hamilton Series is uncertain, due to the fact that no certain exposures of the latter were recognized. In Grant and other counties where both the Genesee and Hamilton outcrop, however, the contact is marked by the occurrence of the Landes Limestone of apparently transitional age. This limestone is present in the Leading Creek Valley and hence it is considered that a full section of Genesee is exposed.

FOSSIL LIFE, GENESEE SERIES.

A patient search of the Genesee at most points will reveal **Buchiola retrostriata** and **Styliolina fissurella,** two of the guide fossils of the series. Some other forms are present in less abundance and there are spores of plants which, in this territory, have not been given serious attention.

CORRELATION, GENESEE SERIES.

There is little doubt as to the identity of the Genesee, as described in many counties of northern West Virginia, with the typical Genesee of New York State. Its lithologic difference from the overlying Portage is clean cut and it also differs materially from the underlying Hamilton in regions where the latter is exposed. On faunal grounds the distinction is even more convincing, since the Genesee almost invariably contains **Styliolina fissurella** and **Buchiola retrostriata,** which may occur occasionally but which are not common in the Portage and Hamilton.

DESCRIPTION OF MEMBERS, GENESEE SERIES.

Black Shale Portion of Genesee.

The black shales, comprising the main bulk of the Genesee, may be studied to best advantage in **New Interest District** along the tributaries of Leading Creek northwest of Kerens. Here they are often revealed in road cuts and small hillocks and in the barren portions of fields where they have not yet weathered into soil. Usually they are black and fissile, weathering into flaky fragments of irregular shapes but with thin edges which on fresh fracture have almost the cutting qualities of a dull knife. When freshly quarried these flakes often exhibit a metallic luster but later they become dull-black and the thin edges lose color, becoming drab or almost white. In the public road north of Stonespring Run and 1.4 miles northwest of Kerens there is an exposure of about 50 feet of these shales, with characteristics as above described, and with marine fossils, the dip being southeastward at an angle of 45°. **Fossil Lot 356** was collected at this locality and, according to Dr. Tilton, contained crinoid stems, **Buchiola retrostriata**, and very abundant **Styliolina fissurella**, as discussed by him in Chapter XV. At the same locality a chemical sample **(No. 737R)** was secured on the land of **H. H. Murphy**, the contents of which are reported by Kaplan and Sigwart as follows:

	Per cent.
Silica (SiO_2)	67.04
Ferric Iron (Fe_2O_3)	5.56
Alumina (Al_2O_3)	17.95
Magnesia (MgO)	1.17
Loss on Ignition	6.55
Undetermined	1.73
Total	100.00

A test of this shale for its oil content was also made, the results of which will be discussed in Chapter IX under the subject of "Oil Shale".

On the south side of Stonespring Run 1.2 miles northwest of Kerens an unsuccessful attempt was once made by J. B. Ward, Jr., to find graphite in these black Genesee shales in a small southern ravine at elevation 2000′ B. Several pits had been dug into the hillside and from one of these comparatively unweathered exposures a chemical sample **(No. 738R)** was collected for analysis on the land of **Frank Vanscoy**, reported by Kaplan and Sigwart as follows:

	Per cent.
Silica (SiO_2)	57.79
Ferric Iron (Fe_2O_3)	5.60
Alumina (Al_2O_3)	19.27
Magnesia (MgO)	1.08
Loss on Ignition	11.00
Undetermined	5.26
Total	100.00

A test of this shale for its oil content was also made, the results of which will be discussed in Chapter IX under the subject of "Oil Shale".

In **Leadsville District** a prospect hole for precious metals was dug many years ago on the land of **Martha A. Bright** on a branch of Horse Run 0.7 mile northwest of Whyte Station. Here some iron pyrites and barite were found as will be more fully described in Chapter XII under the subject of "Precious Metals".

In the southern area of visible Genesee the best exposure is along the south bank of Leading Creek 1.5 miles northwest of Elkins and slightly east of the State road bridge which crosses the creek. Here the visible exposure is about 20 feet thick, being black, fissile, hard, and slaty, with a metallic luster, and with small impressions that may be ostracods or the spores of plants.

Landes Limestone.

The **Landes Limestone** of Reger[11], considered as transitional between the Genesee and Hamilton, is apparently the oldest visible rock of Randolph County. As exposed at a few localities in the valley of Leading Creek it is dark, hard, and about two feet thick, the color being apparently due to the same carbonaceous or bituminous matter as that of the Genesee shale. The few fossils observed were indistinguishable. In **New Interest District** it was once quarried on a small scale and burned for agricultural lime on the land of **Frank Vanscoy** on the south side of Stonespring Run about 1.2 miles northwest of Kerens.

In **Leadsville District** this limestone is said to outcrop in the bed of Horse Run about 0.7 mile northwest of Whyte Station and 300 feet north of the Bright residence. The outcrop was covered by water at the time of the writer's visit but some samples which had been previously secured by Mr. Bright were dark, hard, and fairly pure. According to Mr. Bright this limestone was found at a depth of 10 feet and was penetrated through a thickness of two feet in a well at his residence, the work being then discontinued.

On Horse Run 0.8 mile northwest of Whyte Station the following exposure was noted on the land of **Philip Ware**:

		Feet.
1.	Shale, black, fissile, **Genesee**	10
2.	**Limestone, Landes**, dark, hard, with shaly streaks and with a few indistinguishable marine fossil fragments (1960′ B.)	2
3.	Concealed by alluvium	--

This limestone was once quarried and burned, as will be later discussed in Chapter XI under the subject of "Limestone".

[11]David B. Reger, Mineral and Grant Rept., W. Va. Geol. Survey, pp. 313-14; 1924.

ECONOMIC ASPECTS, GENESEE SERIES.

The shales of the Genesee are low in alumina and have large ignition loss when fired and would therefore be of uncertain value for brick making. They contain a considerable amount of bituminous matter from which oil could be distilled, as will be later discussed in Chapter IX, but their possibilities in this respect will require exhaustive investigation before a proper comparison can be made with other well-known oil shale deposits of the United States. There is some possibility, however, that they might hold natural gas in the western part of the county, as they are known to produce it in considerable quantity in Cabell and other southwestern counties. The possibility of obtaining barite, which has already been noted, will be discussed in Chapter XII. These shales weather to an extremely thin soil which must be heavily fertilized to produce good crops but which is tillable without difficulty in localities where disintegration is sufficiently deep for the plow.

The Landes Limestone, which appears to be too thin for quarrying and mining, has a little local value for agricultural lime, although not so rich as portions of the Greenbrier Series in other parts of the county. It contains considerable silica and would therefore be objectionable for many chemical purposes, aside from its inadequate thickness and scarcity of outcrop.

PART III.

Mineral Resources.

CHAPTER IX.

PETROLEUM AND NATURAL GAS.

INTRODUCTION.

The controlling factor in the accumulation of oil and gas in West Virginia is the Appalachian Geosyncline, or Basin, which enters the State near the southwestern corner of Pennsylvania, passes southwestward across it in a direction nearly parallel to the Appalachian Mountains, and goes into Kentucky about 10 miles south of Kenova, Wayne County. Along this depression, largely covered by rocks of Permo-Carboniferous age, there are abundant pools of oil and gas in the minor structural wrinkles on either side of the basin, but in passing southeastward toward the mountains the oil pools become smaller and more scattered until finally this liquid is not found in commercial quantity. A similar decline occurs in gas, also, but in general its retention in profitable quantity has been considered as extending 15 or 20 miles farther toward the mountains and in the last few years certain new discoveries have proved the existence of commercial gas 50 miles or more southwest of any known pools of oil.

The northwestern corner of Randolph County is approximately 50 miles from the Appalachian Basin and about 30 miles from the nearest large oil pool at Shinnston, Harrison County, but there is commercial gas in Barbour County only 15 miles from this portion of the county, and farther south, in Upshur County, there are some small oil wells near Ivy, only six miles from the Randolph line, with scattered gas wells in the same territory, and there is a small gas pool at Craddock adjacent to the county line.

In Randolph County five wells have been drilled for oil and gas, one of which had a slight show of oil and three of which apparently had shows of gas. A few others have been drilled in Tucker, Pendleton, Webster, and Pocahontas Counties with some slight shows of gas but all have been abandoned. In spite of these discouraging ventures, however, there is some probability that gas may be found in the western part of the county and most certainly this portion will eventually be tested in more detail. A careful discussion of oil and gas is therefore in order, not only to give all available facts on present development but also to show the areas where there is best hope of production and to indicate the nature and depths of possible sands.

There is little evidence for belief that liquid oil in commercial quantity now exists in the county, especially in the three-fourths of its territory lying east of the Rich Mountain range which is west of Tygart Valley. In a large part of the territory east of this mountain the known oil sands of the State are either eroded from the topography or else they outcrop in the mountains so that evaporation of their original oil content, if any, could easily have taken place. It is perhaps true, however, that some bituminous matter still remains in the pores of the sandstones in the form of waxy residues which can not now be recovered, and it is not uncommon to find small pockets of liquid oil trapped in the geodes of limestone quarries. It is also true that some of the Devonian shales have solid bituminous matter from which it is possible to distill a more or less unknown quantity of oil, as will be later discussed.

It is of course true that most of the West Virginia oil sands still remain deeply buried in the region west of Rich Mountain and that throughout the county still deeper sands which produce oil in other States would undoubtedly be found at depths sufficient to afford enough cover for the retention of oil and that they probably have enough porosity to serve as reservoirs. It is also true that the strata are folded into good anticlines and synclines which would aid in the segregation of oil into pools.

In certain other respects the region most decidedly fails to meet the known requirements of oil territory. The very forces which wrinkled the strata into heavy folds have been sufficiently severe to produce incipient metamorphism, which, with its attendant great heat and pressure, may have completely volatilized most of the hydrocarbons, causing their escape from the rocks in gaseous form or their retention as gas in localities where escape has been impossible. It has been established by Dr. David White, of the U. S. Geological Survey, that oil is seldom found in regions where the coals have extremely low volatile and high carbon content; and that gas in such localities is less abundant than in areas where the relative percentage of carbon is smaller, the explanation being that the analysis of the coal reveals the extent to which metamorphism has advanced and gives a criterion by which the same process in the petroleum hydrocarbons may be roughly measured. A carbon ratio for any point may be obtained by dividing the fixed carbon of the proximate analysis of a local coal by the sum of the fixed carbon and the volatile matter of the same analysis, which gives the total carbon contained in the coal on a moisture-free basis. Isocarbs, or lines of equal carbon, may then be obtained by computing the carbon ratios for many points of a given area so that lines of average equal content may be drawn, making available the approximate ratio for any position. A map of this sort recently prepared for the whole State of West Virginia by the writer[1] shows rather conclusively that oil is found in the State principally in regions where the isocarbs indicate a ratio of less than 60, there being a few good pools between 60 and 65, and that gas in quantity has seldom been found where the ratio is above 70.

In Randolph, as shown by the above paper, the average carbon ratio of eight samples of Middle and Lower Kittanning Coal in the northwestern part of the county is 63; and of 15 samples of Sewell Coal in the southeastern part is 67; and of nine samples of Sewell in the central part is 69. Many more samples are now available, however, and the analyses of 51 samples of Sewell in the whole county show an average carbon ratio of 71. These high averages make the occurrence of oil quite improbable and indicate that the search for gas, especially east of Tygart Valley, will be attended with much risk.

In this connection a sample (No. 734R) was collected from carbonized plant stem material in the Valley Head Sandstone of the Chemung Series of the Devonian on Roaring Run, Black Fork District, Tucker County, one-half mile northwest of Hambleton, the same being from No. 19 of the Roaring Run Section, page 195. The analysis, according to Kaplan, is as follows:

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[1]David B. Reger, Carbon Ratios of Coals in West Virginia Oil Fields, Trans. Am. Inst. Min. & Met. Engrs., Vol. LXV, pp. 522-7; 1921.

	Per cent.
Moisture	1.37
Volatile Matter	11.75
Fixed Carbon	26.32
Ash	60.56
Total	100.00
Sulphur	9.87
B. T. U.	3,335

Dividing the fixed carbon by the sum of fixed carbon and volatile matter the quotient, or carbon ratio, is 69.13. This figure is less than the carbon ratios of the coals of the North Potomac (Georges Creek) Basin, but it is evident that this lower ratio is caused by an excess of ash and consequent deficiency of fixed carbon, as may also be noted in some of the dirtier coals.

OIL AND GAS HORIZONS.

The following classification of the various oil and gas sands of the State, taken with slight revisions from former Reports of the Survey, gives the productive horizons of other counties, including some that have produced oil in northwestern Pennsylvania but may not have yielded commercial quantities in West Virginia, as well as the deeper horizons of Ohio and Kentucky, some of which are now being sought for at great expense in various parts of the State. In this table the sands are grouped under the formation names, the titles used by the drillers being given preference, followed in most cases by their geologic equivalents:

Oil and Gas Horizons of West Virginia.

Pennsylvanian:	
Monongahela Series	Carroll Sand (Uniontown).
Conemaugh Series	Minshall Sand (Connellsville). Murphy Sand (Morgantown). Moundsville Sand (Saltsburg). First Cow Run, or Little Dunkard, Sand (Buffalo). Big Dunkard Sand (Mahoning).
Allegheny Series	Burning Springs Sand (Upper Freeport). Gas Sand of Marion and Monongalia Counties (Lower Freeport).
Pottsville Series	Second Cow Run Sand of Ohio (Homewood). Cairo Gas Sand. Cairo Salt Sand. Rosedale Gas Sand (Guyandot). Rosedale Salt Sand (Sharon). Breeden Sand of Mingo County.

Mississippian:		
Mauch Chunk (Red Shale) Series	Princeton Sand. Maxton Sand (Droop) Little Lime (Reynolds? or Glenray?).	
Greenbrier (Limestone) Series	Big Lime.	
Pocono (Sandstone) Series	Keener Sand and Beckett Sand of Milton. Big Injun Sand (Logan, Burgoon). Squaw Sand. Weir Sand (Broad Ford). Berea Sand.	
Devonian:		
Catskill (Red Bed) Series	Gantz Sand. Fifty-foot Sand. Thirty-foot Sand. Gordon Stray Sand. Gordon Sand. Fourth Sand. McDonald, or Fifth, Sand. Bayard, or Sixth, Sand.	
Chemung Series	Elizabeth, or Seventh, Sand (Hendricks). Warren First Sand. Warren Second (Burnside?) Sand. Clarendon, or Tiona, Sand. Speechley Sand. Balltown, or Cherry Grove, Sand. Sheffield, or Cooper (Riley?) Sand. Benson, Bradford? or Deer Lick, Sand. Elk, or Waugh and Porter, Sand.	
Portage Series	Kane Sand.	
Genesee (Black Shale) Series	Childress Sand of Cabell County.	
Hamilton (Brown Shale) Sèries	Gas in Ohio and Kentucky, and in southern West Virginia.	
Marcellus (Black Shale) Series	Gas in Ohio and Kentucky, and in southern West Virginia.	
Corniferous (Columbus) Limestone	Ragland, Menefee, or Irvine, Sand of Kentucky.	
Oriskany Sandstone	Oriskany Sand.	
Helderberg Limestone	Coeymans Sand near base.	"Big Lime" of Ohio.
Silurian:		
Bossardville Limestone		
Rondout Limestone		
Niagara Limestone	Oil in western Kentucky.	
White Medina Sandstone	"Clinton" Sand of Ohio.	

Ordovician:

Martinsburg, or Cincinnati, (Shale) Series	Hudson Sand Group of Kentucky.
Trenton and Other Limestones, (mostly Martinsburg Series)	Trenton Sand Group of northern Ohio.

The sands of the Monongahela, Conemaugh, and Allegheny Series either belong above the topography in Randolph County or else have so little cover that they apparently offer no possibility of having production and need no further comment. Those of the Pottsville are partly beneath drainage in the western fourth of the county but are likewise considered as improbable producers on account of their shallow depths. So far as known the Breeden Sand does not exist in this territory. Nearly all of the Pottsville sands are coarse and porous.

In the Mauch Chunk Series the Princeton has produced some gas in southern West Virginia, notably in Wyoming County. The Maxton Sand, which is apparently the Droop Sandstone, has been a good producer of oil and gas in many counties and in Randolph has the physical qualities of a good sand but on account of outcrops would have no possibilities except along the western edge. The Little Lime has seldom produced oil or gas, being useful mainly as a marker.

The Greenbrier Series, commonly known as the Big Lime, is mostly limestone but contains the Bethel Sandstone zone near the middle which often holds gas in southern West Virginia, and which might possibly have it in the western part of Randolph County.

In the Pocono Series the Keener, Big Injun, and Squaw scarcely exist in the county, being mostly absent by disconformity, and the same statement is mainly true of the Berea. The Weir Sand, on the contrary, is quite often present and appears to be the gas horizon of the Craddock region where it was formerly thought that the Big Injun was the productive horizon. The present field studies, however, show rather conclusively that no Big Injun is present at the outcrop of the Pocono along the eastern side of Rich Mountain and hence the single sand of the Pocono at Craddock can scarcely be called Big Injun.

In the Catskill Series, the sands of which comprise the group commonly known as the Venango in western Pennsylvania and northwestern West Virginia, there are several good, porous sands, most of which produce abundant oil and gas in counties farther west. These sands may be studied at outcrop on the eastern side of Rich Mountain west of Tygart Valley and also at many localities farther east. In the western part of Upshur County they produce considerable gas and they may hold some of it in the western part of Randolph.

The sands of the Chemung Series are usually thin and close-grained but some of them, including the Elizabeth, Burnside, Speechley, Riley, and Benson, have produced gas in northern West Virginia, the Riley and Benson being the principal pay horizons of western Barbour County. The sands of this series probably offer a fair prospect for gas in the western part of Randolph. Some confusion exists relative to the exact position of the Elizabeth Sand. Usually it has been included in the Catskill Series but it was the view of the late Dr. I. C. White that it should correlate with the Hendricks Sandstone. It is now rather clearly established that the Hendricks belongs in the Chemung rather than the Catskill and hence it is classified with the Chemung in the foregoing table. There is also uncertainty as to the proper classification of the Elk and Kane Sands but Dr. White has also expressed the view that the Kane belongs in the Portage and such a division is therefore indicated. The Benson, on the contrary is known to carry Chemung fossils in western Barbour, leaving no doubt as to its proper classification.

In the Portage Series there are few known productive sands, but it is believed that the Kane belongs in it. In Randolph County the Portage is mostly an alternation of shales and flagstones but some thicker beds occur in the lower part. It is also true that some of its dark, sandy shales hold gas in southern West Virginia, so that as a reservoir of gas it is not without possibilities.

The Genesee Series, which is mostly black, fissile shale, is also an abundant producer of gas in Cabell and other southern counties, being known as the Childress Sand. The wells in this series and in the Portage seldom show much gas when first completed but after being shot with large quantities of solid explosives often make good producers.

The shales of the Hamilton Series, which are brown and somewhat sandy, and those of the Marcellus which are black and fissile, also produce gas in southern West Virginia and Kentucky, responding to shots in the same manner as those of the Genesee. Some dark limestone often occurs in the Marcellus and has often been confused with the Corniferous. The true Corniferous Limestone has seldom been found at outcrop in West Virginia, being mainly absent by disconformity. It is therefore probable that the dark lime correlated as Corniferous in various deep wells in the northern and western parts of the State should be called the Lower

Selinsgrove rather than the Corniferous, although the true Corniferous appears to have been found in a few wells. As a producer of oil and gas in the State its possibilities are very limited.

The Oriskany Sand, which is nearly always coarse and porous and often 100 feet or more in thickness, has a considerable possibility for gas in Randolph County, as it is covered at all points, but it is very deep in the territory west of Tygart Valley. On the Deer Park Anticline its depth would not be excessive but the danger of crooked holes on account of sloping strata would be considerable. This sand was found in good thickness at the **Parsons Pulp & Lumber Company No. 1 (15) Well** at Parsons, Tucker County, but carried salt water.

The Helderberg Limestone generally has little porosity but near its base the Coeymans sandy zone has produced gas in a few instances. The Bossardville and Rondout are likewise without porosity but the Niagara produces large quantities of oil in western Kentucky and also some gas in the same State. Judging by its character in counties farther east it would probably be a shaly limestone in Randolph County. All these limestones, partly in the Devonian and partly in the Silurian, together form the group known as the "Big Lime" of Ohio.

At the base of the Silurian the White Medina Sandstone, known as the "Clinton" Sand in Ohio where it has produced much gas and oil, is probably present in good thickness beneath all of Randolph County and on theoretical grounds would have some possibility as a gas reservoir. Its thickness probably varies from 100 to 200 feet but in most of the county its depth would be excessive. Along the Deer Park Anticline, however, a hole started on the Genesee outcrop west of Montrose would reach it at 2500 or 3000 feet.

The Ordovician formations outcrop in eastern West Virginia but they are deeply buried in the oil and gas fields of the western part of the State and their possibilities are totally unknown. They would also be very deep in Randolph County and it is doubtful whether an attempt to reach them would be justified.

TABLES OF OIL AND GAS SAND INTERVALS.

The two following tables will indicate the estimated depths at which the known or prospective oil and gas sands may be found below the two key-rocks which have been used for preparing structure maps in Randolph County. The first of these tables shows intervals below the Sewell

(Sharon) Coal and will be found the more convenient for use in the territory west of the Rich Mountain range which lies west of Tygart Valley and in the Otter Creek and Shavers Fork country along the North Potomac (Georges Creek) Syncline. In this table no sands which belong above the Sewell Coal are noted, since the prospect of getting gas in such shallow sands is extremely remote.

The second table shows estimated intervals below the top of the Big Lime (Greenbrier) and is applicable to the environs of Tygart Valley and to the country east of Shavers Mountain in a portion of which the same horizon has been used to plot structure contours.

In both tables it should be fully understood that the rocks below the Genesee do not outcrop in the county and only two wells have been drilled to depths slightly below this series. The intervals assigned to these lower formations are therefore based in part on the record of deep wells in other counties, in part on the outcrops farther east, and in part on the collateral evidence of the known thickening and thinning of the strata over wide areas. It is possible that some of these intervals to the deeper sands may contain errors of several hundred feet but it is thought that the information will nevertheless be of value:

Table of Oil and Gas Sand Intervals below Sewell (Sharon) Coal.

(Expressed in feet to top of sands.)

SAND	Norton	Cassity	Pickens	Whitaker Falls	Otter Creek	Bowden	Bemis	Cheat Bridge	Hopkins
Sewell (Sharon) Coal	0	0	0	0	0	0	0	0	0
Rosedale Salt (Sharon) Sand	50	50	50	50	50	50	50	100	100
Breeden Sand	....	....	....	....	....	....	....	....	....
Princeton Sand	200	200	200	300	150	150	100	150	150
Stony Gap Sand	300	300	300	700	350	400	450	650	700
Maxton (Droop?) Sand	400	400	450	1050	550	700	750	950	950
Big Lime	540	600	675	1325	850	975	1000	1200	1250
Keener Sand	....	....	....	....	....	....	....	....	....
Big Injun Sand	....	....	....	....	....	....	....	....	....
Squaw Sand	....	....	....	....	....	....	....	....	....
Weir (Broad Ford) Sand	700	800	1000	1750	1100	1225	1200	1425	1675
Berea Sand	....	....	....	....	....	....	....	....	....
Gantz Sand	800	900	1100	1900	1200	1325	1300	1550	1775
Fifty-foot Sand	875	975	1175	1975	1275	1375	1400	1650	1850
Thirty-foot Sand	950	1050	1250	2050	1350	1450	1500	1750	1950
Gordon Stray Sand	1025	1125	1300	2125	1425	1525	1600	1850	2050
Gordon Sand	1100	1200	1350	2200	1500	1600	1700	1950	2150
Fourth Sand	1200	1300	1425	2275	1600	1700	1800	2000	2200
Fifth Sand	1300	1400	1500	2350	1700	1800	1900	2100	2300
Sixth (Bayard) Sand	1400	1500	1550	2425	1800	1900	2000	2200	2400
Seventh (Elizabeth) (Hendricks) Sand	1500	1600	1650	2500	1900	2000	2100	2300	2500
Warren First Sand	1800	1900	2000	2850	2200	2300	2400	2600	2800
Warren Second Sand	2100	2200	2300	3150	2500	2600	2700	2900	3100
Clarendon Sand	2500	2600	2600	3450	2900	3000	3100	3300	3500
Speechley Sand	2800	2900	2900	3750	3200	3300	3400	3600	3800
Balltown Sand	3000	3100	3200	4050	3400	3500	3600	3800	4000
Sheffield (Riley) Sand	3250	3350	3450	4300	3650	3750	3850	4050	4250
Benson (Bradford) Sand	3500	3600	3700	4550	3900	4000	4100	4300	4500
Elk Sand	4000	4100	4200	5050	4300	4400	4500	4700	4900
Kane Sand	4500	4600	4700	5550	4700	4800	4900	5100	5300
Childress Sand (Genesee Shale)	6500	6600	6700	7500	6700	6800	6900	7100	7300
Hamilton Series (shale)	6700	6800	6900	7700	6900	7000	7100	7300	7500
Marcellus Series (shale)	7100	7200	7300	8100	7300	7400	7500	7700	7900
Oriskany Sand	7500	7600	7700	8500	7700	7800	7900	8100	8300
Helderberg Lime	7600	7700	7800	8600	7800	7900	8000	8200	8400
Coeymans Sand	7900	8000	8100	8900	8100	8200	8300	8500	8700
"Clinton" Sand (White Medina)	9000	9100	9200	10000	9200	9300	9400	9600	9800
Martinsburg Series (shale)	9800	9900	10000	10800	10000	10100	10200	10400	10600
Trenton Sand (lime)	10500	10600	10700	11500	10700	10800	10900	11100	11300

Table of Oil and Gas Sand Intervals below Top of Big Lime (Greenbrier).

(Expressed in feet to top of sands.)

SAND	Montrose	Elkins	Valley Head	Wymer	Glady	Laneville	Harman	Horton	Osceola
Big Lime (Greenbrier) (top)	0	0	0	0	0	0	0	0	0
Keener Sand	...	...	...	...	...	...	...	...	...
Big Injun Sand	...	...	..	...	...	...	...	...	...
Squaw Sand	...	...	...	...	...	...	...	...	...
Weir (Broad Ford) Sand	200	200	300	250	200	350	300	300	300
Berea Sand	275	...	400	...	...	500	400	375	...
Gantz Sand	325	300	450	300	300	550	450	400	400
Fifty-foot Sand	400	375	525	400	400	625	550	500	500
Thirty-foot Sand	475	450	600	525	525	700	650	625	625
Gordon Stray Sand	550	525	675	650	650	800	750	775	775
Gordon Sand	625	600	750	775	775	900	900	925	925
Fourth Sand	700	700	825	850	850	1000	1050	1075	1075
Fifth Sand	800	800	900	1000	975	1100	1200	1250	1250
Sixth (Bayard) Sand	900	900	950	1150	1100	1200	1350	1400	1400
Seventh (Elizabeth) (Hendricks) Sand	1000	1000	1000	1300	1200	1300	1550	1600	1600
Warren First Sand	1300	1300	1300	1600	1500	1600	1800	1900	1900
Warren Second Sand	1600	1600	1600	1900	1800	1900	2100	2200	2200
Clarendon Sand	2000	2000	2000	2300	2200	2300	2500	2600	2600
Speechley Sand	2300	2300	2300	2600	2500	2600	2800	2900	2900
Balltown Sand	2500	2500	2500	2800	2700	2800	3000	3100	3100
Sheffield (Riley) Sand	2750	2750	2750	3050	2950	3050	3250	3350	3350
Benson (Bradford) Sand	3000	3000	3000	3300	3200	3300	3500	3600	3600
Elk Sand	3500	3500	3500	3800	3700	3800	4000	4100	4100
Kane Sand	4000	4000	4000	4300	4200	4300	4500	4600	4600
Childress Sand (Genesee Shale)	6300	6200	6200	6700	6600	6700	6900	7000	7000
Hamilton Series (shale)	6500	6400	6400	6900	6800	6900	7100	7200	7200
Marcellus Series (shale)	6900	6800	6800	7300	7200	7300	7500	7600	7600
Oriskany Sand	7300	7200	7200	7700	7600	7700	7900	8000	8000
Helderberg Lime	7400	7300	7300	7800	7700	7800	8000	8100	8100
Coeymans Sand	7700	7600	7600	8100	8000	8100	8300	8400	8400
"Clinton" Sand (White Medina)	8800	8700	8700	9200	9100	9200	9400	9500	9500
Martinsburg Series (shale)	9600	9500	9500	10000	9900	10000	10200	10300	10300
Trenton Sand (lime)	10300	10200	10200	10700	10600	10700	10900	11000	11000

SUMMARIZED WELL RECORDS.

The following table shows at a glance the summarized records or other information on 17 wells which have been drilled for oil and gas in Randolph County or closely adjacent territory. Most unfortunately very little information is available on the two wells which have been drilled in Tygart Valley where records would be extremely valuable. In this table the serial numbers are the same as those used on Map II. The letter "L" signifies a spirit-level and "B" an aneroid or barometric determination of surface elevation. All depths are expressed in feet. The following abbreviations of company names have been used:

Buckhannon Chemical	Buckhannon Chemical Company.
Greater Pittsburgh	Greater Pittsburgh Oil and Gas Company.
Hope	Hope Natural Gas Company.
Hurst et al.	W. P. Hurst and others.
Mead et al.	E. A. Mead and others.
Owens	Owens Bottle Machine Company.
Parsons P. & L.	Parsons Pulp and Lumber Company.
Pittsburgh & West Va.	Pittsburgh and West Virginia Gas Company.
T. V. Oil	Tygart Valley Oil Company.

Summarized Record of Tests for Oil and Gas in Randolph County.

No. on Map II	Name of Property	Magisterial District	Company	Elevation above Sea-Level Feet	Sewell Coal Depth Top Feet	Sewell Coal Thickness Feet	Maxton Sand Depth Top	Maxton Sand Thickness Feet	Big Lime Depth Top	Big Lime Thickness Feet
1	J. K. P. Koon Heirs No. 1.......	Washington (Upshur)	Pittsburgh & West Va.	2083'L	...	...	...	...	915	85
2	Grimm No. 1....................	Washington (Upshur)	Owens	....	308	5	565	55	885	85
3	Isherwood & Cody No. 1........	Washington (Upshur)	Isherwood & Cody	2117'B	...	...	740	100	990	282
4	Edward H. Peck No. 1...........	Banks (Upshur)....	Buckhannon Chemical..	2230'B	712	...	1055	50	1240	55
5	Silica Sand Co. No. 1	Banks (Upshur)....	Greater Pittsburgh	2050'B	...	...	1190	30	1225	95
6	Silica Sand Co. No. 2...........	Banks (Upshur)....	Greater Pittsburgh	2035'B	470	5	945	25	979	321
7	Silica Sand Co. No. 3...........	Banks (Upshur)....	Greater Pittsburgh	2505'B	865	4	1500	30	1530	257
8	Silica Sand Co. No. 4	Banks (Upshur)....	Greater Pittsburgh	2505'B	...	...	1440	17	1566	120
9	Sherman Heirs No. 1...........	Banks (Upshur)....	Greater Pittsburgh	2025'B	390	6	1015	50	1065	235
10	Sherman Heirs No. 2...........	Banks (Upshur)....	Greater Pittsburgh	2355'B	...	...	1380	45	1430	96
11	Butts-McCormick-Wilson No. 1..	Banks (Upshur)....	Greater Pittsburgh	2310'B	...	...	1300	20	1320	269
12	Buckhannon Chemical Co. No. 1..	Middle Fork	Buckhannon Chemical..	1905'L	...	...	695	40	1005	125
13	Mayton Lumber Co. No. 4903....	Middle Fork	Hope	2265'B	...	...	1110	44	1281	60
14	John J. Betler No. 1...........	Middle Fork	Hurst et al.	2725'B	600	3	1025	62	1357	248
15	Parsons Pulp & Lumber Co. No. 1	Black Fork (Tucker)	Parsons P. & L.	1650'B	...	...	...	...	...	...
16	Alonzo W. Murphy No. 1........	New Interest	Mead et al.	1995'B	...	...	...	...	...	...
17	P. C. Daniels No. 1.............	Beverly	T. V. Oil	1990'B	...	...	...	...	...	...

Weir Sand Depth Top	Weir Sand Thickness Feet	Fifty-ft. Sand Depth Top	Fifty-ft. Sand Thickness Feet	Gordon Sand Depth Top	Gordon Sand Thickness Feet	Fifth Sand Depth Top	Fifth Sand Thickness Feet	Speechley Sand Depth Top	Speechley Sand Thickness Feet	Benson Sand Depth Top	Benson Sand Thickness Feet	Total Depth	Producing Sand and Remarks	No. on Map II
1008	77	1375	15	1624	22	1767	14	2630	10	...	...	2992	Gordon Stray and Warren Second, gas shows	1
970	50	1150	50	...	...	1500	25	...	...	...	...	2161	Big Lime, Fourth, Elizabeth, light gas	2
1272	68	1397	30	...	...	...	...	...	...	...	...	1450	Maxton, 50-ft., oil shows................	3
1295	45	1565	30	...	...	...	...	...	...	...	...	1766	Fifty-foot, gas show	4
1325	39	...	...	...	...	...	...	...	...	...	...	1366	Weir gas, 3 to 5 million................	5
1309	...	...	...	...	...	...	...	...	...	...	...	1350	Weir gas, 10 million....................	6
1787	41	...	...	...	...	...	...	...	...	...	...	2220	Weir gas; Maxton oil show............	7
1792	38	...	...	...	...	...	...	...	...	...	...	1820	Salt, oil show; Maxton, oil and gas shows; Weir gas show..............	8
1300	28	...	...	...	...	...	...	...	...	...	...	1584	Weir gas show	9
1526	44	1683	7	1890	60	...	...	...	...	...	...	3270	Fifty-foot oil, 10 bbl.; Weir and Elizabeth gas shows	10
1589	20	?	?	...	...	2200	52	...	...	...	...	2252	Dry hole	11
...	...	1230	8	...	...	...	...	...	...	...	...	1481	Dry hole	12
...	...	...	...	...	...	...	...	3383	27	...	...	4949	Speechley oil show	13
1613	30	...	...	1948	10	2088	30	3488	25	4256	15	5038	Dry hole? Gas show?...................	14
...	...	...	...	...	...	...	...	...	...	...	...	4250	Kane? and Lower Selinsgrove gas shows..	15
...	...	...	...	...	...	...	...	...	...	...	...	2385	Gas show	16
...	...	...	...	...	...	...	...	...	...	...	...	2000?	Gas show	17

DETAILED WELL RECORDS AND PROSPECTIVE GAS AREAS.

DETAILED WELL RECORDS AND PROSPECTIVE GAS AREAS, ROARING CREEK DISTRICT.

In Roaring Creek District no wells have been drilled for oil and gas. At Harding a water well which had been drilled in 1920, or thereabouts, to a depth of about 50 feet on the land of **Mrs. Kate Foy,** but which had been abandoned on account of hardness, was cleaned out for use in the summer of 1929 and found to contain so much oil on the water as to make it unfit for use. A sample of this oil was brought to the Survey by Miss Frankie Long, of Elkins, and when tested by Mr. Kaplan proved to be a kerosene of the heavier grade with a Baume gravity of 42° at 60° Fahrenheit and with a boiling range of 160 to 260° Centigrade, and being translucent. The natural conclusion on such an occurrence would be that leakage from a store or filling station into the well had taken place but according to Miss Long the position of the well was such that leakage could scarcely occur. In such case it would therefore appear that some crude oil which has been partly distilled by natural process has remained trapped in the Pottsville sandstones which form the floor of the Belington Syncline at this locality until the drilling of a well and the attendant flow of water released it. Similar instances of trapped and partly distilled oil in regions remote from oil pools are on record elsewhere and this occurrence, while interesting, does not indicate much hope of commercial oil.

In this district, as shown by Map II, the monoclinal structure is broken by the Belington Syncline and Hiram Anticline. On the latter fold some deep wells have been drilled in Barbour County, one of which, located southeast of Philippi, showed about 50,000 feet of gas in the Fourth Sand, and another of which, located on the anticline near Clements, was reported to have a show of Big Injun gas.

From Kingsville southward to the Middle Fork District line this anticline is a considerable structural feature, without closure but with an axis rising rapidly to the southward. In this locality the Sewell Coal horizon is 400 to 500 feet below drainage and hence wells would reach the Speechley Sand at depths of about 3300 feet and the Benson at depths of about 4000 feet. Such wells would be expensive and the risk would be great but the locality is not without possibilities of commercial gas.

DETAILED WELL RECORDS AND PROSPECTIVE GAS AREAS, MIDDLE FORK DISTRICT.

In Middle Fork District only three wells have been drilled for oil and gas, all of which have been abandoned without commercial production but in the adjacent portion of Upshur County there are several commercial wells and others which were dry or too light to justify pipe-lines. The three following wells were drilled in Washington District and the records have been previously published in the Report on Barbour, Upshur and the western portion of Randolph Counties, but the records have been thoroughly revised in accordance with the more accurate present knowledge of the sands:

J. K. P. Koon No. 1 Well (1).

Washington District, Upshur County; on Laurel Run of Right Fork of Middle Fork River at Sunny Point School 1 mile east of Queens; authority, Pittsburgh & West Virginia Gas Company; elevation, 2083' L.

	Thickness. Feet.	Total Feet.
Pottsville Series (470'+)		
Red rock (probably from oxidation)	17	17
Lime	73	90
Shells	30	120
Sand, Salt, limy	220	340
Slate	10	350
Sand, Salt	45	395
Sand, Salt, limy	15	410
Sand, Salt, white	60	470
Mauch Chunk Series (445')		
Slate	10	480
Lime	20	500
Lime, red	130	630
Lime and sand, Maxton	250	880
Lime and shells	35	915
Greenbrier Series (93')		
Big Lime	85	1000
Slate	8	1008
Pocono Series (262')		
Sand, Weir	77	1085
Slate	10	1095
Sand, Weir (continued), pebbly	12	1107
Lime and shells	163	1270
Catskill Series (665')		
Lime, red	105	1375
Sand, Fifty-foot	15	1390
Lime and red rock	47	1437
Lime, gritty	16	1453
Red rock	57	1510
Sand, Gordon Stray (gas, 1530')	45	1555
Red rock and shells	69	1624
Sand, Gordon	22	1646
Red rock	12	1658

	Thickness. Feet.	Total. Feet.
Lime	15	1673
Sand, Fourth, limy	22	1695
Slate	10	1705
Sand	7	1712
Lime	25	1737
Lime and shells	30	1767
Sand, Fifth	14	1781
Slate	17½	1798½
Lime and shells	126½	1925
Sand, Bayard, limy	10	1935
Chemung Series (1057'+)		
Lime and shells	250	2185
Sand (little gas) 20' / Break 2 / Sand 13 } Warren Second?	35	2220
Lime and slate	185	2405
Slate, black	3	2408
Lime and shells	222	2630
Sand, Speechley?, dark	10	2640
Lime	10	2650
Sand	45	2695
Break	4	2699
Sand	21	2720
Slate	5	2725
Sand, Cherry Grove?	15	2740
Lime and shells to bottom	252	2992

Well abandoned as unproductive.

According to the driller's report enough gas was found in the above well to burn with a flame four or five feet high at the well mouth. In the tight sands of the Chemung Series a shot would greatly increase the flow.

Grimm No. 1 Well (2).

Washington District, Upshur County; on a branch of Leonard Run of Middle Fork River, about 1.2 miles southwest of Queens; authority, Owens Bottle Machine Company.

	Thickness. Feet.	Total. Feet.
Pottsville Series (460'+)		
Conductor	11	11
Sand, white	10	21
Shale, black	11	32
Quicksand	2	34
Sand	31	65
Coal, Eagle?	2	67
Shale	13	80
Lime	50	130
Shale, black	4	134
Sand, hard	62	196
Slate and shells	112	308
Coal, Sewell	5	313
Shells and slate	27	340
Sand, Rosedale Salt, white	120	460

	Thickness. Feet.	Total. Feet.
Mauch Chunk Series (425')		
Slate	15	475
Lime, gritty	50	525
Red rock	40	565
Sand, Maxton, white	55	620
Shells and slate	80	700
Lime, red	20	720
Shells and slate	60	780
Lime	15	795
Slate, black	25	820
Lime, white	25	845
Slate and shells	40	885
Greenbrier Series (85')		
Big Lime (gas, 955')	85	970
Pocono Series (50')		
Sand, Weir	50	1020
Catskill Series (625')		
Red rock	5	1025
Sand, Gantz	70	1095
Shells and slate	55	1150
Sand, Fifty-foot	50	1200
Shells and slate	20	1220
Lime	105	1325
Red rock	95	1420
Sand, Fourth, red (gas, 1425')	50	1470
Red rock	30	1500
Sand, Fifth	25	1525
Shells and slate	80	1605
Sand, Bayard, white	30	1635
Slate	10	1645
Chemung Series (516'+)		
Sand, Elizabeth (Hendricks) white, (gas, 1675')	55	1700
Red rock	10	1710
Sand	15	1725
Slate and shells	150	1875
Sand, black, Warren First	10	1885
Slate and shells to bottom	276	2161

"Made enough gas for two or three families, but was abandoned."

Isherwood & Cody No. 1 Well (3).

Washington District, Upshur County; on Panther Fork of Buckhannon River at Stockerts; authority, Isherwood & Cody through R. B. Cody; elevation, 2117' B.

	Thickness. Feet.	Total. Feet.
Pottsville Series (340'+)		
Unrecorded	47	47
Slate (10" casing, 47')	83	130
Sand	15	145
Coal, Eagle?	2	147
Sand	13	160
Slate	15	175
Lime	47	222
Slate	93	315
Sand, hard	25	340

		Thickness. Feet.	Total. Feet.
Mauch Chunk Series (650')			
Lime		50	390
Red rock		15	405
Lime		35	440
Sand, white		30	470
Slate, black		15	485
Sand		165	650
Red rock		90	740
Sand, Maxton (some oil)		100	840
Red rock		70	910
Lime		10	920
Red rock		70	990
Greenbrier Series (282')			
Lime	30'		
Sand	25		
Lime	153	Big Lime 282	1272
Red rock	2		
Lime	72		
Pocono Series (26')			
Sand, Weir		26	1298
Catskill Series (152'+)			
Red rock		17	1315
Sand, Gantz		25	1340
Slate		10	1350
Red rock		5	1355
Slate		30	1385
Sand		10	1395
Red rock		2	1397
Sand, Fifty-foot (oil show)		30	1427
Unrecorded to bottom		23	1450

The above well was abandoned as dry but had an interesting show of oil and it did not reach the deep sands of the Chemung Series in which there would be a possibility of gas.

The nine following records are wells which have been drilled in or adjacent to the Craddock Gas Field mostly in Banks District, Upshur County, but partly in Randolph County. Of these nine wells three were profitable gas wells in the Weir Sand and one had a creditable show of oil in the Fifty-foot Sand. As previously stated, it was formerly believed that the productive gas sand was the Big Injun but that idea has proved untenable because no Big Injun is found at outcrop along the eastern slope of Rich Mountain where the entire Pocono is visible for many miles.

Edward H. Peck No. 1 Well (4).

Banks District, Upshur County; on Pecks Run of Little Kanawha River, 1 mile east of Canaan; completed, October, 1912; authority, Buckhannon Chemical Company; elevation, 2230' B.

	Thickness. Feet.	Total. Feet.
Pottsville Series (855'+)		
Loam and quicksand, black	22	22
Sand, Salt, gray	35	57
Slate, black	28	85
Sand, Salt, gray	45	130
Slate, black	30	160
Sand, Salt, gray	35	195
Slate, black	15	210
Sand, Salt, gray	55	265
Slate, black	30	295
Limestone, gray	30	325
Slate, black	95	420
Sand, Salt, gray	25	445
Slate, black	5	450
Coal, Hughes Ferry	3	453
Slate, black	35	488
Limestone, white	32	520
Slate, black	5	525
Sand, Salt, white	30	555
Slate, black	65	620
Sand, Salt, gray	20	640
Slate, black	15	655
Limestone, white	57	712
Slate, black, Sewell Coal horizon	10	722
Sand, Salt of Rosedale, white (salt water, 830')	133	855
Mauch Chunk Series (385')		
Limestone, white	15	870
Slate, black	45	915
Red rock	70	985
Limestone, blue	4	989
Red rock	31	1020
Limestone, gray	15	1035
Red rock	20	1055
Sand, Maxton, gray	50	1105
Limestone, gray	25	1130
Slate and shells, black	55	1185
Red rock	55	1240
Greenbrier Series (55')		
Big Lime, gray	55	1295
Pocono Series (150')		
Sand, Weir, white	45	1340
Slate, black, Coffee	5	1345
Limestone, blue	100	1445
Catskill Series (321'+)		
Sand, Gantz, pink	10	1455
Limestone, white	110	1565
Sand, Fifty-foot, white (light gas in top)	30	1595
Red rock and shells	35	1630
Slate and shells, gray	55	1685
Sand, Thirty-foot, pink	12	1697
Slate and shells, white	43	1740
Red rock	5	1745

	Thickness. Feet.	Total. Feet.
Sand, Gordon Stray, gray	12	1757
Red rock and shells to bottom	9	1766

10" casing, 22' 10"; 8" casing, 407'; 6⅝" casing, 989'.

The above well was abandoned, although making a small amount of gas.

Silica Sand Co. No. 1 Well (5).

Banks District, Upshur County; on west side of Buckhannon River, at Craddock; authority, Greater Pittsburgh Oil & Gas Company; completed in June. 1905; elevation, 2050' B.

	Top. Feet.	Bottom. Feet.
Pottsville Series (500'+)		
Conductor	0	16
Unrecorded (water, hole full, 30')	16	200
Sand, Salt	200	240
Unrecorded (water, hole full, 380')	240	408
Sand, Salt (broken-up sand shells)	408	500
Mauch Chunk Series (720')		
Lime	660	675
Sand	675	700
Sand, pebbly	925	1065
Sand	1065	1085
Sand, Maxton	1190	1220
Greenbrier Series (95')		
Big Lime	1225	1320
Pocono Series (46'+)		
Slate	1320	1325
Sand, Weir (gas, 1332' and 1350')	1325	1364
Total depth		1366

8¼" casing, 200'; 6⅝" casing, 660'. "Well gauged 175 pounds in 2" tubing first minute; rock pressure, about 375 to 400 pounds; initial production, 3 to 5 million cu. ft."

Silica Sand Co. No. 2 Well (6).

Banks District, Upshur County; on west side of Buckhannon River, 0.2 mile north of Craddock; authority, Greater Pittsburgh Oil & Gas Company; completed, October 29, 1905; elevation, 2035' B.

	Top. Feet.	Bottom. Feet.
Pottsville Series (600'+)		
Unrecorded (water, 45-150')	0	300
Sand	300	325
Sand	413	447
Coal, Sewell (water)	470	475
Limestone	490	550
Sand, Salt of Rosedale, Upper Raleigh	550	600
Mauch Chunk Series (370')		
Red rock	600	890
Sand	890	910
Sand, Maxton	945	970

PLATE XXXIX.—View from State road one mile southeast of Monterville, looking slightly west of south. In background is Elk Mountain capped by Pottsville. At middle left is a Pocono dip slope and in foreground is a limestone sinkhole in the Greenbrier Series. (Photo. by E. E. Harris.)

PLATE XL.—Pickaway Limestone of Greenbrier Series along Seneca Trail at head of Tygart Valley one-half mile northwest of Mace. A zone of vertical cleavage is visible at top. (Photo. by E. E. Harris.)

PLATE XLI.—Union Limestone (mostly Fredonia portion) of Greenbrier Series in cut along Seneca Trail at head of Tygart Valley one-third mile northwest of Mace. (Photo. by E. E. Harris.)

PLATE XLII.—Monongahela Construction Company limestone quarry at Faulkner, all in Greenbrier Series. At the top a zone of shaly Cypress Sandstone is discarded, followed below by 6 or 8 feet of white oolite (Gasper), then by 3 feet of red and green shale (Bethel Sandstone zone), then by 70 feet of hard limestone (Fredonia) to base of quarry.
(Photo. by E. E. Harris.)

	Top. Feet.	Bottom. Feet.
Greenbrier Series (321')		
Big Lime	979	1300
Pocono Series (50'+)		
Slate and shells	1300	1309
Sand, Weir (break of slate, 1315-1317'; gas, steel-line measure, 1328')	1309	
Total depth		1350

Drilled pocket to 1418'; 10" casing, 23'; 8¼" casing, 490'; 6⅝" casing, 1309'. Initial gas estimated 10 million cu. ft. Rock pressure in 1908 was 325 pounds.

Silica Sand Company No. 3 Well (7).

Banks District, Upshur County; on hill west of Buckhannon River and 0.3 mile west of Craddock; completed, February 21, 1906; drilled deeper in 1915; authority, Greater Pittsburgh Oil and Gas Company; elevation, 2505' B. Starts at base of Lower Kittanning Coal.

	Thickness. Feet.	Total. Feet.
Pottsville Series (990')		
Sand, Second Cow Run, Homewood	59	59
Coal, Upper Mercer	6	65
Sand	70	135
Coal, Lower Mercer (Stockton)	7	142
Sand, Upper Connoquenessing	58	200
Slate	50	250
Sand	60	310
Slate	20	330
Lime	70	400
Sand	45	445
Slate	45	490
Lime, gritty	45	535
Slate	20	555
Lime, gritty	35	590
Coal, Eagle	3	593
Lime, gritty	47	640
Slate	10	650
Coal, Hughes Ferry	6	656
Lime	59	715
Sand, Harvey	35	750
Slate	10	760
Lime, gritty	76	836
Coal, Sewell "B"	6	842
Lime	23	865
Coal, Sewell	4	869
Lime, gritty (8¼" casing, 887')	18	887
Lime, gritty	38	925
Sand, Salt, Upper Raleigh, (gas 930'; water, 940' and 990')	65	990
Mauch Chunk Series (540')		
Slate	20	1010
Sand, Princeton	40	1050
Lime	15	1065
Unrecorded	70	1135
Red rock	45	1180

	Thickness. Feet.	Total. Feet.
Slate	20	1200
Red rock	30	1230
Lime	50	1280
Red rock	60	1340
Sand	20	1360
Red rock	15	1375
Sand	30	1405
Red rock	10	1415
Lime	15	1430
Sand	30	1460
Red rock	30	1490
Lime	10	1500
Sand, Maxton (oil, 1530′)	30	1530
Greenbrier Series (257′)		
Big Lime (6⅝″ casing, 1730′)	257	1787
Pocono Series (51′)		
Sand, Weir (gas, 1800′ and 1818′)	41	1828
Unrecorded to bottom	10	1838
Drilled deeper in 1915:		
Catskill Series (382′+)		
Red rock	4	1842
Slate and shell	48	1890
Red rock	10	1900
Slate and shell	10	1910
Red rock	4	1914
Slate and shell	16	1930
Red rock and shells	5	1935
Slate and shells	15	1950
Red rock and shells	175	2125
Lime	25	2150
Red rock and shells	70	2220

The above well was for several years a profitable producer in the Weir Sand but was finally drilled deeper, finding nothing in the lower sands.

Silica Sand Co. No. 4 Well (8).

Banks District, Upshur County; on the ridge east of Buckhannon River and 0.4 mile east of Craddock; authority, Greater Pittsburgh Oil & Gas Company; elevation, 2505′ B.

	Thickness. Feet.	Total. Feet.
Pottsville Series (1019′)		
Soil	4	4
Sand, Second Cow Run, Homewood	66	70
Slate	12	82
Sand, (water, 120′)	61	143
Lime	53	196
Slate	52	248
Sand, (water, 300′)	59	307
Slate	99	406
Lime	77	483
Slate	54	537
Sand	157	694
Coal, Hughes Ferry?	1	695

	Thickness. Feet.	Total. Feet.
Slate	28	723
Lime	41	764
Slate	45	809
Lime	34	843
Sand, Salt of Rosedale (slight show of oil, 850')	176	1019
Mauch Chunk Series (547')		
Lime	41	1060
Red rock	368	1428
Lime	12	1440
Sand, Maxton (slight show of oil and gas, 1447')	17	1457
Slate	58	1515
Sand	43	1558
Slate	8	1566
Greenbrier Series (220')		
Big Lime	120	1686
Unrecorded	100	1786
Maccrady Series (6')		
Red rock	6	1792
Pocono Series (38'+)		
Sand, Weir (break of red rock, 1800-1803'; slight show of gas, 1810')	38	1820

Conductor, 8'; 8" casing, 730'; 6" casing, 1570'; 5" casing, 1794'.

This well was abandoned on account of its light show of gas.

Sherman Heirs No. 1 Well (9).

Banks District, Upshur County; on west side of Buckhannon River, 0.5 mile northeast of Craddock; authority, Greater Pittsburgh Oil & Gas Company; completed, January 9, 1906; elevation, 2025' B.

	Thickness. Feet.	Total. Feet.
Pottsville Series (396'+)		
Unrecorded	40	40
Coal, Powellton (?)	3	43
Slate	37	80
Coal, Eagle	6	86
Lime	34	120
Sand, Salt	30	150
Lime	80	230
Slate	70	300
Lime	70	370
Slate	20	390
Coal, Sewell	6	396
Mauch Chunk Series (669')		
Red rock	9	405
Sand	45	450
Lime	50	500
Red rock	80	580
Lime	20	600
Red rock	300	900
Lime	34	934
Sand	26	960
Lime	55	1015

	Thickness. Feet.	Total Feet.
Sand, Maxton	50	1065
Greenbrier Series (235')		
Big Lime	235	1300
Pocono Series (28')		
Sand, Weir (gas, 1322')	28	1328
Catskill Series (256')		
Red rock	5	1333
Sand, Gantz	20	1353
Red rock	47	1400
Lime	20	1420
Red rock	30	1450
Lime	25	1475
Red rock	50	1525
Lime	20	1545
Red rock	30	1575
Lime to bottom	9	1584

10" casing, 36'; 8¼" casing, 405'; 6½" casing, 1300'.

"Well would have made probably sufficient gas to run a boiler."

Sherman Heirs No. 2 Well (10).

Banks District, Upshur County; on Pecks Run of Little Kanawha River, 0.7 mile northwest of Craddock; authority, Greater Pittsburgh Oil & Gas Company; completed in 1906; elevation, 2355' B.

	Thickness. Feet.	Total. Feet.
Pottsville Series (935'+)		
Conductor	16	16
Sand (hole full of water, 60')	59	75
Lime	45	120
Slate	30	150
Sand	40	190
Lime	30	220
Slate	22	242
Coal, Campbell Creek	3	245
Slate (water at 250'; 14 bailers per hour)	30	275
Lime	105	380
Sand, Salt (just a show of oil, 390')	30	410
Lime	40	450
Slate	50	500
Sand	30	530
Slate	15	545
Coal, Castle	3	548
Sand	52	600
Slate	5	605
Lime	15	620
Coal, Hughes Ferry	5	625
Slate	30	655
Sand	10	665
Slate, black, ("should be Craddock Coal but we washed it out and found black slate only")	5	670
Lime	15	685
Slate	40	725
Lime	50	775

	Thickness. Feet.	Total. Feet.
Sand, Salt	35	810
Slate	35	845
Sand, Salt	45	890
Slate	10	900
Sand, Salt of Rosedale, Upper Raleigh	35	935
Mauch Chunk Series (495′)		
Red rock	130	1065
Slate	25	1090
Red rock	20	1110
Lime	50	1160
Red rock	70	1230
Lime	45	1275
Red rock	30	1305
Sand	18	1323
Slate	22	1345
Lime	20	1365
Slate	15	1380
Sand, Maxton	45	1425
Slate	5	1430
Greenbrier Series (96′)		
Big Lime	96	1526
Pocono Series (44′)		
Sand, Weir (gas, 1528′)	44	1570
Catskill Series (585′)		
Lime	110	1680
Red rock	3	1683
Sand, Fifty-foot (show of oil, 1683′)	7	1690
Red rock	20	1710
Sand, Thirty-foot	10	1720
Slate and shells	50	1770
Red rock	100	1870
Sand, Gordon Stray	15	1885
Red rock	5	1890
Sand 25′ / Red rock 10 / Sand 25 } Gordon	60	1950
Red rock	85	2035
Sand, Fifth	25	2060
Red rock	7	2067
Slate	5	2072
Sand, Bayard	38	2110
Red rock	45	2155
Chemung Series (1115′+)		
Sand, Elizabeth (Hendricks) (gas, 2170′)	55	2210
Slate	375	2585
Lime	85	2670
Slate and shells	15	2685
Lime	50	2735
Slate and shells	215	2950
Lime	50	3000
Slate and shells	150	3150
Lime	65	3215
Slate and shells	55	3270
Lime	---	----

10″ casing, 103′; 8¼″ casing, 715′; 6⅝″ casing, 1693′. Made 10- to 12-barrel oil show in Fifty-foot Sand but was not produced.

Butts-McCormick-Wilson No. 1 Well (11).

Banks District, Upshur County; on Hell Run, 0.9 mile southwest of Craddock; authority, Greater Pittsburgh Oil & Gas Company; completed, August 16, 1905; elevation, 2310′ B.

	Top. Feet.	Bottom. Feet.
Pottsville Series (605′+)		
Unrecorded (water, 20′)	0	150
Sand, Salt	150	180
Lime	225	275
Sand, Salt	275	325
Lime	350	400
Unrecorded (water, 440′)	400	500
Lime	500	550
Sand, Salt, Upper Raleigh	550	605
Mauch Chunk Series (715′)		
Red rock	725	830
Slate and lime shells	830	905
Sand, Maxton	1300	1320
Greenbrier Series (269′)		
Big Lime	1320	1589
Pocono Series (37′)		
Sand, Weir (steel line)	1589	1609
Slate	1609	1613
Sand	1613	1626
Catskill Series (626′)		
Sand, white, Gantz, Fifty-foot, and Thirty-foot	1626	1935
Lime	1980	2010
Sand, dark, Gordon Stray	2010	2080
Shells and slate	2080	2200
Sand, sharp, Fifth	2200	2252
Total depth (steel line)		2252

10″ casing, 53′; 8¼″ casing, 485′. Dry hole.

Buckhannon Chemical Company No. 1 Well (12).

Middle Fork District, Randolph County; at forks of Right Fork of Buckhannon River just south of Newlonton; completed in 1913; authority, Buckhannon Chemical Company; elevation, 1905′ L.

	Thickness. Feet.	Total. Feet.
Pottsville Series (500′+)		
Sand and gravel	12	12
Shale, black (conductor, 16′)	18	30
Sand, Upper Nuttall, hard	50	80
Slate, black	25	105
Sand, Lower Nuttall	25	130
Coal, Hughes Ferry	1	131
Sand	29	160
Lime	40	200
Slate	40	240
Lime	65	305
Sand	20	325
Slate	15	340
Lime	15	355

	Thickness. Feet.	Total. Feet.
Slate (8" casing)	5	360
Sand, Salt	140	500
Mauch Chunk Series (505')		
Slate	14	514
Red rock	46	560
Lime	60	620
Red rock	65	685
Slate	10	695
Sand	40	735
Lime	35	770
Red rock	25	795
Slate	40	835
Lime	35	870
Slate	10	880
Sand	35	915
Slate and shells	5	920
Sand, Maxton	85	1005
Greenbrier Series (125')		
Big Lime	125	1130
Catskill Series (351'+)		
Red rock	3	1133
Lime	97	1230
Sand, Fifty-foot	8	1238
Red rock and shells	147	1385
Sand, Gordon Stray	8	1393
Red rock and shells to bottom	88	1481
Dry hole.		

The following record, which was used as part of the Arvondale Junction Section, pages 144-5, is herein repeated without the attachment of overlying surface measurements in order to exhibit more clearly the depths to the deep sands of the Chemung. Apparently no Benson Sand was found:

Mayton Lumber Co. No. 4903 Well (13).

Middle Fork District, Randolph County; on west side of Buckhannon River at Arvondale Junction; authority, Hope Natural Gas Company; completed, November 30, 1917; elevation, 2265' B.

	Top. Feet.	Bottom. Feet.
Pottsville Series (610'+)		
Sand, hard (water, 94'), Lower Gilbert and Dotson	0	150
Lime, white, hard	150	157
Sand, white, hard (10" casing, 170')	157	170
Sand, dark, hard	170	190
Sand, white, hard (water, 210')	190	350
Slate, black	350	460
Slate, dark (Sewell Coal horizon)	460	470
Sand, gray, Rosedale Salt, Upper Raleigh	470	610
Mauch Chunk Series (671')		
Slate	610	630

	Top. Feet.	Bottom. Feet.
Gritty lime (8¼" casing, 670')	630	685
Sand, gray, Princeton	685	700
Slate, gray	700	750
Lime, gray	750	790
Slate, light	790	820
Lime, light	820	860
Gray————?	860	900
Red rock	900	
Lime, white	1090	1110
Sand, Droop, Maxton?	1110	1154
Slate and shells	1154	1232
Sand, Webster Springs	1232	1246
Slate	1246	1258
Little Lime (Glenray)	1258	1268
Slate and shells	1268	1281
Greenbrier Series (60')		
Big Lime	1281	1341
Pocono Series (61')		
Sand, Weir	1341	1402
Catskill Series (673')		
Unrecorded	1402	2075
Chemung Series (2874'+)		
Sand, gray (6⅝" casing, 2081'), Elizabeth (Hendricks)	2075	2091
Slate and shells	2091	2155
Sand, gray	2155	2163
Slate and shells	2163	2395
Lime, white	2395	2475
Sand, white, Warren First?	2475	2525
Slate and shells	2525	3383
Sand, gray, Speechley (oil at 3393')	3383	3410
Slate	3410	3735
Sand, dark-grey	3748	3754
Slate and shells	3754	3768
Sand, gray, Riley, Sheffield?	3768	3782
Slate and shells	3782	4000
Slate, soft, black	4000	4275
Lime, gritty	4275	4310
Slate and shells	4310	4390
Slate	4390	4630
Slate and shells	4630	4925
Total depth		4949

"Plugged and abandoned."

The following well reveals in much detail the deep sands of the Devonian in the vicinity of Pickens, although recording no gas. According to A. W. Ewing, civil engineer, of Pickens, there was enough gas to make lights around the well when drilling was in progress, but the horizon of its occurrence is not named in the record:

John J. Betler No. 1 Well Record (14).

Middle Fork District, Randolph County; on Upper Trout Run of Left Fork of Buckhannon River 0.2 mile southwest of Haslebacher

School and 2 miles northeast of Pickens; commenced, January 1, 1926; authority, W. P. Hurst et al. through A. W. Ewing; elevation, 2725' B.

	Top. Feet.	Bottom. Feet.
Pottsville Series (717'+)		
Clay and sand	0	140
Sand, Brownstown	140	210
Slate, black	210	275
Lime (shale)	275	285
Lime (shale), gritty	285	375
Slate and shells	375	480
Lime (shale)	480	495
Slate, black	495	555
Sand, Guyandot (water, 560')	555	575
Shells and slate	575	600
Coal, Sewell (water, 600')	600	603
Lime (shale)	603	615
Slate, white	615	635
Lime (shale)	635	645
Sand, Upper Raleigh (Sharon)	645	717
Mauch Chunk Series (640')		
Red rock	717	742
Sand, Princeton	742	772
Red rock	772	812
Lime (shale)	812	818
Red rock	818	855
Sand, Stony Gap	855	923
Slate, white	923	930
Lime	930	945
Red rock	945	1025
Sand, green, Maxton (Droop)	1025	1087
Red rock	1087	1215
Slate, white	1215	1275
Sand, Webster Springs	1275	1357
Greenbrier Series (248')		
Lime, white } Big Lime	1357	1482
Lime, white } Big Lime	1482	1605
Maccrady Series (8')		
Red rock	1605	1613
Pocono Series (75')		
Sand, red, Weir (Broad Ford)	1613	1643
Slate, white	1643	1688
Catskill Series (510')		
Red rock	1688	1710
Slate, white	1710	1728
Red rock and lime (shale)	1728	1948
Sand, gray, Gordon	1948	1958
Red rock	1958	2013
Slate, white	2013	2028
Sand, gray, Fourth	2028	2073
Red rock	2073	2088
Sand, red, Fifth	2088	2118
Slate, white	2118	2128
Sand, Sixth, Bayard	2128	2151
Red rock	2151	2171
Lime (shale) and slate	2171	2198

	Top. Feet.	Bottom. Feet.
Chemung Series (2840′)		
Sand, Elizabeth (Hendricks)	2198	2298
Slate and shells	2298	3488
Sand, Speechley	3488	3513
Slate and shells	3513	3731
Sand and slate	3731	3777
Sand, Balltown	3777	3792
Slate	3792	3869
Sand	3869	3889
Slate, white	3889	3914
Sand, Riley, Sheffield?	3914	3929
Slate and shells	3929	4161
Lime (shale)	4161	4201
Slate and shells	4201	4256
Sand, Benson	4256	4271
Slate and shells	4271	4286
Lime (shale)	4286	4441
Slate and shells	4441	4561
Lime (shale) and shells	4561	4676
Slate and shells, to bottom	4676	5038

In Middle Fork District there is a considerable prospect for gas in the deep sands along the Hiram Anticline, the axis of which has not been tested by any well yet drilled in Randolph County, since the **Betler No. 1 (14)**, which is the nearest, was located two miles from the arch. There will be considerable risk in drilling this anticline and hence such a venture should be undertaken only by companies or individuals having sufficient financial background to stand a loss in case the territory should prove unproductive.

One very favorable locality for drilling would be on the axis of the arch where it crosses Middle Fork River two miles northwest of Cassity. Here a well could be started 200 feet below the Sewell Coal and would reach the Speechley Sand at about 2700 feet, the Benson at about 3400 feet, the Childress Sand (Genesee Shale) at about 6400 feet, the Oriskany Sand at about 7400 feet, and the "Clinton" (White Medina) Sand at about 8900 feet.

On Long Run, where the anticline crosses it, 2½ miles west of Cassity, the drilling depths would be about the same as above noted since there is a rise both in the topography and in the structure contours.

At the mouth of Beech Run of Left Fork of Buckhannon River about two miles north of Hartridge a well would start 300 feet or more below the Sewell Coal and should reach the Speechley Sand at about 2600 feet, the Benson at about 3400 feet, the Childress at about 6400 feet, the Oriskany at about 7300 feet, and the "Clinton" at about 8900 feet.

DETAILED WELL RECORDS AND PROSPECTIVE GAS AREAS, NEW INTEREST DISTRICT.

New Interest District is almost wholly anticlinal, being dominated by the Deer Park Anticline which passes southward through its center and which rises to a structural dome at the southern end of the district, the elevation of the strata in this vicinity being greater than at any other point along the same arch in West Virginia.

The following well, drilled at Parsons, Tucker County, is outside the limits of New Interest District but exhibits the strata that may be expected at considerable depth. The well had shows of gas in the Kane? Sand and Lower Selinsgrove Limestone but encountered salt water in the Oriskany Sand and was abandoned. Some revisions, based on more accurate knowledge of the strata since this record was first published in the Tucker County Report, have been made. Reference to the structure map of Tucker County would show that this well is located considerably southeast of the Deer Park Anticline, being on a secondary arch:

Parsons Pulp and Lumber Company No. 1 Well (15).

Black Fork District, Tucker County; on west side of Shavers Fork of Cheat River at southern end of Parsons; started February 14, 1912; authority, Parsons Pulp and Lumber Company; elevation, 1650′ B.

	Thickness. Feet.	Total. Feet.
Chemung Series (500′+)		
Conductor	15	15
Unrecorded (hole full of water in blue sand at 41′)	55	70
Hard boulders and slate	50	120
Lime shells	265	385
Pink rock	5	390
Unrecorded (8″ casing at 475′)	110	500
Portage Series (1840′)		
Lime, gritty (little gas at 500′)	325	825
Sand, Kane?, black, (little gas)	10	835
Unrecorded (hole reduced at 940′)	103	938
Shale, black, and lime shells (pocket of gas at 1093′)	162	1100
Slate	500	1600
Shale, black	175	1775
Shells, black, hard	65	1840
Lime, hard, black	120	1960
Slate and shells	150	2110
Lime, hard, blue	20	2130
Slate, white	210	2340
Genesee Series (160′)		
Slate, black	30	2370
Hard, black (slate?)	130	2500

	Thickness. Feet.	Total. Feet.
Hamilton Series (630')		
Slate	180	2680
Lime, hard, black, gritty	350	3030
Slate, black, and shells	100	3130
Marcellus Series (850')		
Slate, black, with a few shells	550	3680
Slate and shells	145	3825
Lime, Lower Selinsgrove, gritty (gas pocket at 3830')	20	3845
Unrecorded	135	3980
Oriskany Series (270')		
Sand, white, Oriskany (salt water, 3990-4000'; 8 to 10 bbls. daily)	80	4060
"Sand shells and slate from that until we got the present sand"	190	4250

The following well is located within the bounds of New Interest District:

Alonzo W. Murphy No. 1 Well (16).

New Interest District, Randolph County; on Saltlick Run of Leading Creek 0.6 mile southwest of Montrose; authority, E. A. Mead et al.; elevation, 1995' B.

According to Mr. E. A. Mead, of Parkersburg, West Virginia, one of the interested parties, the detailed record has been lost, but he gives the following statement from memory:

"The formation was a bastard lime to about 600 feet, then brown shale to about 1850 feet, then brown shale and shells to 2385 feet, the total depth. The whole formation was on a slope. We got crooked holes every time we got a shell and had to drill from 1850 feet to the finish with a long star bit in order to get along at all."

According to Mr. Murphy, a large amount of alum (?) water was encountered, but no salt water, and there was one small pocket of gas that blew for one hour strong enough that the fire under the boiler was extinguished for safety.

This well starts on the axis of the Deer Park Anticline but considerably north of the summit of the dome, the surface outcrops being Portage. As indicated by Mr. Mead's letter it is evident that the Genesee was encountered at about 600 feet and that the remainder of the hole was in Middle Devonian shales, being stopped near the top of the Oriskany Sandstone. In view of the fact that gas is now being obtained in these same shales in southern West Virginia the showing of gas reported by Mr. Murphy has considerable significance.

Drilling for gas in New Interest District would be hazardous not only on account of remoteness from known producing fields but also because of the sloping strata which tend to deflect the drill and make a crooked hole. In spite of these disadvantages such a project might be justified in the case of an operator having ample exploration funds. The anticline has an enormous closure, extending from the southern end of Randolph County northward to New Interest District and then declining farther north in West Virginia and Maryland, so that if there is any entrapment of gas along the arch no better theoretical point for exploration than the southern end of this district could be found. It is now possible to do such exploratory work with the diamond drill, affording protection against crooked holes and insuring a detailed record and samples of the strata. Such a hole started on the axis of the arch about 1½ miles west of Kerens would begin at the base of the Genesee shales and for the first 1000 or 1200 feet would afford a test for the Middle Devonian shales. The Oriskany Sand would then be found at 1000 feet or more beneath the surface, the Coeymans Sand at about 1400 feet, the "Clinton" (White Medina) at about 2500 feet and the Trenton Lime at about 4000 feet.

DETAILED WELL RECORDS AND PROSPECTIVE GAS AREAS, LEADSVILLE DISTRICT.

In Leadsville District, which lies next south of New Interest and is controlled by the same anticlinal structure, no tests for oil and gas have been made. Mr. O. J. King of Elkins reports that a seepage of oil has been known for the last 35 years at a wet-weather, or intermittent, spring near Whyte Station where it is possible to skim off the oil when water flows from the spring. A sample of this oil, which was furnished by Mr. King and which is practically colorless, was tested by Mr. Kaplan and found to be gasoline, boiling between 212 and 420° Fahrenheit. The natural assumption in such a case would be that it came from a leaky gas pipeline or gasoline station but Mr. King, on further inquiry, reported that the nearest gas line is four or five miles away and that the nearest filling station is not only one-fourth mile away but has been in existence only since the summer of 1929 as compared to a known seepage of oil for many years. Obviously the oil is an entrapment of partly distilled crude oil, much like that which is reported at Harding, being an indication that oil may have once existed in some quantity in the region but that it has now been largely dissipated by heat and pressure.

The remarks previously made on various aspects of a possible test for deep gas in New Interest District should apply to Leadsville District without essential difference. The

Genesee is above drainage at the northern end of Leadsville District and again near the mouth of Leading Creek and is but thinly covered in the intervening territory along the axis of the anticline. Drilling depths would be only slightly larger and other conditions would be about the same.

DETAILED WELL RECORDS AND PROSPECTIVE GAS AREAS, BEVERLY DISTRICT.

In Beverly District the only well drilled is as follows:

P. C. Daniels No. 1 Well (17).

Beverly District; on south side of Files Creek 1.3 miles southeast of Beverly; completed about 1903; authority, Tygart Valley Oil Company; elevation, 1990' B.

The detailed record of this hole could not be secured but it starts in the Portage Series, probably about 500 feet below the top, and according to Mr. Daniels was drilled to a depth of 1900 or 2000 feet, which should put it about through the Portage, and some light shows of gas were found. In 1910 the collected gas blew off the top of the conductor and when visited by the writer in 1915 or 1916 gas was still escaping from the hole.

The possibility of gas along the Deer Park Anticline in Beverly District is much the same as in New Interest and Leadsville except that the arch is gently declining toward the south so that, from a theoretical standpoint, the quantity would be less, as the gas would have a tendency to migrate northward to the top of the dome. If gas should be found with good volume and pressure on the dome, however, tests in Beverly District would then be justified. At Beverly the Childress Sand (Genesee Shale) would be found only a few hundred feet below the surface, the top of the Oriskany would be at 1200 to 1500 feet, the top of the Coeymans at 1600 to 1900 feet, the top of the "Clinton" (White Medina) at 2700 to 3000 feet, and the top of the Trenton at 4200 to 4500 feet.

DETAILED WELL RECORDS AND PROSPECTIVE GAS AREAS, VALLEY BEND DISTRICT.

In Valley Bend District no tests for oil and gas have been drilled. As shown by Map II, the Deer Park Anticline extends southward through the district, declining and flattening toward the south. Tests for gas would scarcely be justified unless an abundant quantity would be found farther north along the anticline. On its axis near Valley Bend the depth to the top of the Childress Sand (Genesee Shale) would be 500 feet or more, to the Oriskany 1500 feet or more, to the Coeymans 1900 feet or more, to the "Clinton" (White Medina) 3000 feet or more, and to the Trenton 4500 feet or more.

DETAILED WELL RECORDS AND PROSPECTIVE GAS AREAS, HUTTONSVILLE DISTRICT.

In Huttonsville District no tests for oil and gas have been drilled. Its principal structural feature is the Deer Park Anticline which extends southward through its center, while the North Potomac (Georges Creek) Syncline goes through its eastern portion. On the anticline, along Tygart Valley, the prospect for gas will largely depend on such results as may be obtained farther north in the valley. If gas should be found in some abundance as far south as Valley Bend, further tests would then be justified in Huttonsville District. On the axis of the arch just south of Huttonsville the top of the Childress Sand (Genesee Shale) would probably be found at about 1000 feet, the Oriskany at about 2000 feet, the Coeymans at about 2400 feet, the "Clinton" (White Medina) at about 3500 feet, and the Trenton at about 5000 feet.

DETAILED WELL RECORDS AND PROSPECTIVE GAS AREAS, MINGO DISTRICT.

Mingo District occupies the extreme southern end of the county, next to Pocahontas and Webster. Its monoclinal structure is interrupted by the Deer Park Anticline, which extends southward through the middle of the district, and by the North Potomac (Georges Creek) Syncline, which goes through its eastern edge. No tests for oil and gas have been drilled but at Webster Springs, Webster County, a fairly deep hole was once drilled on the **C. P. Dorr** land, as published in the Webster Report, pages 97-8, finding a gas pocket at 1500 feet, in a formation doubtfully correlated as the Elizabeth Sand. The total depth was 2085 feet, penetrating 473 feet into the Chemung Series.

In the edge of Pocahontas County, southward from the extreme southern tip of Mingo District, a fairly deep hole was once drilled, the record of which was published by the writer in the Webster Report, page 123, and repeated by Paul H. Price in the Pocahontas Report, pages 103-4, with certain radical changes suggested by the writer on account of increased stratigraphic knowledge of the Mississippian rocks. This record, which has bearing on Mingo District, is as follows:

Pocahontas County Coal and Land Company No. 1 Well.

Edray District, Pocahontas County; on the north side of Williams River one mile southwest of Big Spruce Knob, seven miles northwest of Marlinton, and 9.7 miles S. 5° E. of southern tip of Mingo District; authority, Pocahontas County Coal and Land Company through Hubert Echols; elevation, 3390' B.

	Thickness. Feet.	Total. Feet.
Mauch Chunk Series (607'+)		
Unrecorded	180	180
Lime formation	50	230
Unrecorded	377	607
Greenbrier Series (546')		
Big Lime	546	1153
Pocono Series (309')		
Unrecorded	164	1317
Sand, Weir, Broad Ford (oil show?)	145	1462
Catskill Series (874')		
Red rock	101	1563
Unrecorded	5	1568
Sand, Fifty-foot	104	1672
Red rock	109	1781
Sand, Thirty-foot, white	31	1812
Sand, Gordon Stray, broken	146	1958
Shale	50	2008
Sand, Gordon, Fourth, and Fifth, good	245	2253
Slate	19	2272
Red rock	64	2336
Chemung Series (696'+)		
Sand, Elizabeth (Hendricks)	36	2372
Slate	12	2384
Sand	60	2444
Slate	13	2457
Sand	85	2542
Slate and shell to bottom	490	3032

"Hole was drilled 10" diameter for 120'; 8" for 1520'; 6¼" for balance; 660' of 8" casing being used. No salt water in well at all. A slight showing of oil was found in the upper sand, sufficient to grease the tools and bailer. All sand struck was very, very hard."

The above well was located on monoclinal structure southwest of the southern end of the Deer Park Anticline.

In Mingo District the best possibility for gas would probably be in the deep sands along the Deer Park Anticline and the advisability of a test would depend on such results as might be secured on the higher portions of the arch farther north in Tygart Valley. On Stewart Run at the extreme northern end of the district a well could be started in the top of the Portage Series and would reach the Childress Sand (Genesee Shale) at about 2200 feet, the Oriskany at about 3200 feet, the Coeymans at about 3600 feet, the "Clinton" (White Medina) at about 4700 feet, and the Trenton at about 6200 feet. At Valley Head all depths would be about 2500 feet greater than at Stewart Run, on account of the rapidly declining axis; and at the point where the arch crosses Tygart River southeast of Upper Mingo they would be nearly 3500 feet greater than at Stewart Run.

DETAILED WELL RECORDS AND PROSPECTIVE GAS AREAS, DRY FORK DISTRICT.

Dry Fork District occupies an immense territory in the northeastern part of the county and its structure from west to east successively exhibits the North Potomac (Georges Creek) Syncline, Blackwater Anticline, Job Syncline, Horton Anticline, and Stony River Syncline. No tests for oil and gas have been drilled but the **Parsons Pulp & Lumber Company No. 1 (15)**, the record of which is published on pages 427-8, is only six miles north of the district line. On the east the **Mrs. Clara Harper No. 1**, located on the west side of North Fork of South Branch of Potomac River, three-fourths mile north of Riverton, Pendleton County, and seven miles southeast of Horton, Randolph County, was drilled to a depth of 1850 feet, as published in the Tucker County Report, page 272. This well started in the Middle Devonian shales near an outcrop of Oriskany Sandstone which dips at an angle of 75° and actually penetrated only a few hundred feet of strata when horizontally figured, and hence its record is of little or no value.

There is small hope of finding gas in Dry Fork District on account of its proximity to the highly folded Appalachian Mountains. The Blackwater Anticline exhibits a huge and structurally perfect dome farther north in Tucker County, but descends to a saddle near Jenningston and then its axis rises southward to the Pocahontas County line beyond which it soon merges into the monoclinal slope of the Browns Mountain Anticline as mapped by Price in the Pocahontas Report. No test of this country would appear justifiable but on the axis of the Blackwater Anticline where it crosses East Fork of Glady Fork two miles southeast of Glady (town) a well would start 700 to 1000 feet below the top of the Chemung Series and would reach the Childress Sand (Genesee Shale) at about 4500 feet, the Oriskany Sand at about 5500 feet, the Coeymans Sand at about 4900 feet, the "Clinton" (White Medina) Sand at about 6000 feet, and the Trenton Lime at about 7500.

OIL SHALES.

In the description of the Genesee Series, page 396, reference has been made to the possibility of distilling oil from this bituminous shale. A distillation made by Mr. Kaplan from a portion of Sample No. 737R, collected on the land of H. H. Murphy on the north side of Stonespring Run 1.5 miles northwest of Kerens, New Interest District, showed four gallons of the heavier petroleum derivatives per short ton of shale, with a considerable amount of ammonia and hydrogen sulphide. This sample was from a roadside outcrop which had been considerably weathered. Another distillation was made from Sample No. 738R collected on the land of Frank Vanscoy on the south side of Stonespring Run 1.1 miles northwest of Kerens, showing 4.7 gallons of similar oil per ton of shale together with ammonia and hydrogen sulphide. This sample, as previously explained, was taken from a rather freshly dug pit and was less weathered than the Murphy sample.

These results are interesting but do not show that the shale would have present economic value for the production of crude oil. The shales are favored by accessibility to transportation, being within easy reach of the Western Maryland Railway, and by a good topographic situation, being exposed over a considerable area where they could be excavated by steam shovel, but their oil content is too small for competition with the richer shales of the West and with crude oil which can now be more cheaply obtained from wells. It is probably true, however, that core drill samples from localities where the shales are sufficiently buried to prevent oxidation and natural distillation would show a somewhat larger percentage of oil.

CHAPTER X.

COMMERCIAL COAL.

INTRODUCTION.

In Chapter VI a systematic description of all the coal seams found in Randolph County has been given, together with their correlations. Many of the beds are too thin, lenticular, or impure to be of commercial rank and all such have been fully described in the Chapter named, measured sections at openings and prospects being detailed. In the present Chapter numerous actual measured sections for those coals that are of minable thickness and purity and estimates of their probable tonnage, with etchings showing their areal extent, will be given.

Within the county there appear to be 16 coals that have minable thickness and 23 others too thin, impure, or irregular to be of more than local value, some of these latter being thin beds that are of scientific interest only. The minable seams, in descending order, are the Bakerstown ("Thomas") of the Conemaugh Series; the Upper Freeport ("Davis"), Upper Kittanning, Middle and Lower Kittanning, and Clarion of the Allegheny Series; and the Upper Mercer, Lower Mercer (Stockton), Quakertown (Winifrede?), Campbell Creek (Peerless), Eagle, Gilbert, Hughes Ferry, Castle, Sewell (Sharon), Welch, and Fire Creek of the Pottsville Series.

Figure 15 shows the different coal seams of the county, giving not only their relative thickness but also the maximum interval (base to base) between them. Figures 16 to 30, inclusive, published in the present Chapter, will show approximately where the commercial seams occur in possible minable thickness in the county.

In general these coals are all bituminous, those west of Tygart Valley being medium-high in volatile matter but considerably lower than those of central West Virginia, and those of the Otter Creek and Shavers Fork country being medium low in volatile matter and bordering on the smokeless classification but appreciably higher than the coals of the Potomac and Pocahontas regions.

The coals are variously used for steam and domestic

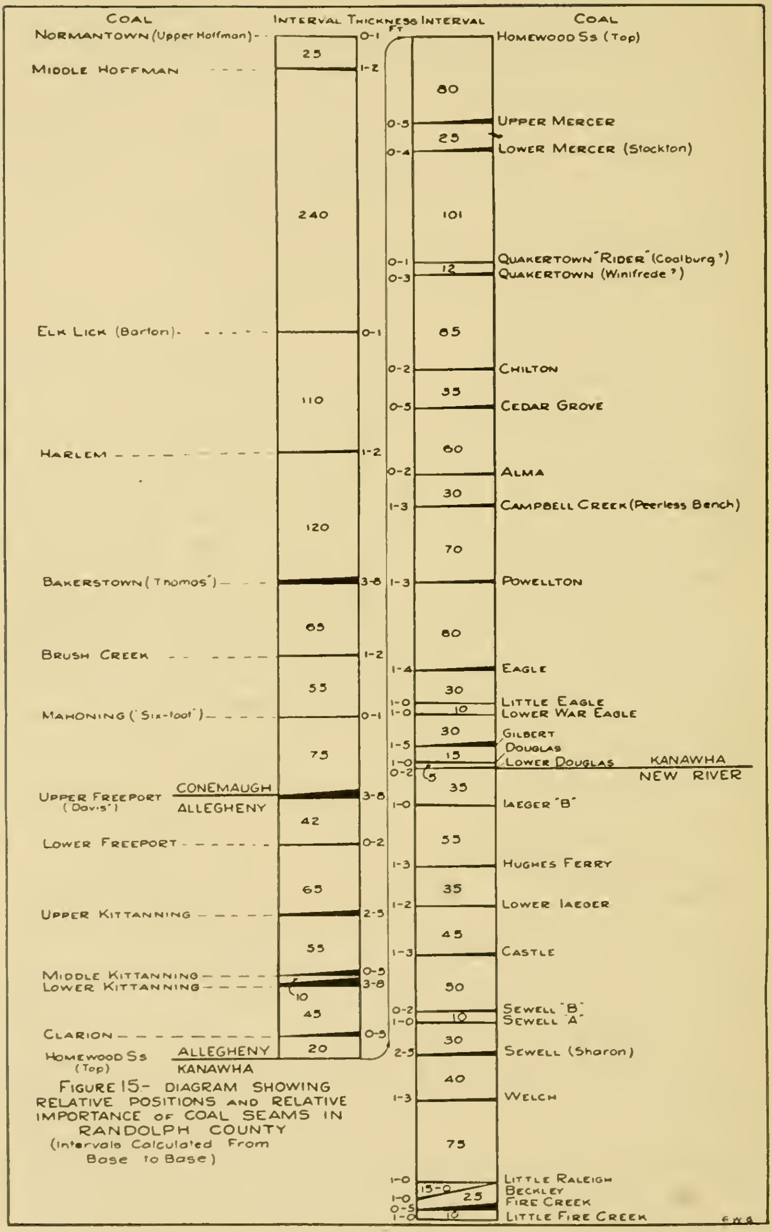


Figure 15— Diagram showing relative positions and relative importance of coal seams in Randolph County (Intervals Calculated From Base to Base)

fuel, coking, smithing, and metallurgical purposes, and for mixing with higher volatile coals to produce gas and by-product coke. Owing to their low ash and sulphur and the ease with which they may be crushed the coals of the New River Group would be well adapted for use in mechanical stokers or for powdered fuel, their fusing point of ash being so high that clinkering would appear almost impossible.

STATISTICS OF COAL PRODUCTION.

Commercial coal mining has been practiced in Randolph County for many years, the first record of production being in 1893. Following that year there is a blank in the statistics until 1899, the record of mining being continuous from the latter year to date.

Mining began in the Middle and Lower Kittanning Coals of the Allegheny Series along the Belington Syncline and still continues. In comparatively recent years, however, there has been some operation of the Kanawha Group of coals near Pickens on the waters of Buckhannon River and at Hopkins on Shavers Fork. Still more recently mining has begun in the New River Group of coals, mostly in the Sewell (Sharon) seam, the operations being partly at Cassity on Middle Fork River west of Rich Mountain and partly along Shavers Fork east of Cheat Mountain. The value of the Sewell Coal has been recognized for many years, however, by lumber companies which have at various times temporarily mined it at Hartridge, Beech Run, Mill Creek, Back Fork of Elk, and perhaps other localities.

The following tables, mainly assembled from statistics given in the Annual Reports of the West Virginia Department of Mines, supplemented by certain unpublished data from R. M. Lambie, present Chief, gives the coal and coke production of the county since 1899, the relative rank in production as compared to other counties, and the production of coal and coke by mines:

Randolph County Coal Production.

(Production by fiscal years ending June 30 of each year up to June 30, 1924; production by calendar years starting January 1, 1925).

Year.	Long Tons. (2240 lbs.)	=Short Tons. (2000 lbs.)	Order.
1893	937	1049	18
1894	----	----	--
1895	----	----	--
1896	----	----	--
1897	----	----	--
1898	----	----	--
1899	31,975	35,812	21
1900	103,207	115,592	14
1901	167,883	188,029	14
1902	265,687	297,569	14
1903	388,487	435,105	12
1904	356,531	399,315	13
1905	416,834	466,854	13
1906	569,443	637,776	12
1907	609,380	682,506	13
1908	545,803	611,299	14
1909	463,206	518,791	14
1910	700,290	784,325	14
1911	788,662	883,302	13
1912	716,632	802,628	14
1913	741,567	830,555	14
1914	737,718	826,244	15
1915	550,108	616,121	18
1916	684,556	766,703	16
1917	708,638	793,675	19
1918	874,760	979,731	19
1919	847,257	948,928	19
1920	789,942	884,735	20
1921	775,869	868,973	19
1922	369,730	414,098	22
1923	702,554	786,860	21
1924	(504,258)	564,769	22
1924(a)	(234,222)	262,329	--
1925(b)	(537,705)	602,230	23
1926(b)	(570,627)	639,102	23
1927(b)	(524,425)	587,356	23
1928(b)	(400,205)	448,229	24
Totals----	16,679,098	18,680,590	----

(a) Last six months of 1924.
(b) Production by calendar years.

Randolph County Coke Production.

Year	Short Tons 2000 lbs.	Order
1900	3,223	12
1901	13,498	7
1902	38,845	6
1903	120,387	6
1904	77,077	6
1905	146,243	5
1906	231,616	5
1907	244,054	5
1908	129,273	6
1909	128,401	5
1910	183,405	5
1911	130,694	6
1912	119,513	5
1913	171,919	5
1914	152,280	5
1915	67,381	4
1916	114,415	5
1917	120,811	5
1918	123,725	6
1919	100,907	5
1920	62,059	5
1921	38,831	5
1922	------	--
1923	56,304	6
1924	10,299	8
1925	6,220	8
1926	38,314	4
1927	15,425	5
1928	755	7
Total -------------	2,645,874	---

Note: Production is by fiscal years up to June 30, 1924; production for 1925 includes last 6 months of 1924 and all of calendar year 1925; production thereafter is by calendar years.

Coal Tonnage Production in Randolph County by the Various Mines for the Year Ending June 30, 1893.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	DISTRIBUTION OF COAL. Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
		937	---	?	---	?
For the Year Ending June 30, 1894.						
		---	---	---		---
For the Year Ending June 30, 1895.						
		---	---	---	---	---
For the Year Ending June 30, 1896.						
		---	---	---	---	---
For the Year Ending June 30, 1897.						
		---	---	---	---	--- ---
For the Year Ending June 30, 1898.						
		---	---	---	---	---

Coal Tonnage Production in Randolph County by the Various Mines for the Year Ending June 30, 1899.

Name of Company	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	DISTRIBUTION OF COAL.			
			Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Randolph Coal Co.	Randolph	31,975	10	692	----	31,273

For the Year Ending June 30, 1900.

Name of Company	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Randolph Coal Co.		79,604	548	2,548	----	76,508
Junior Coal Co.		19,078	25	184	4,704	14,165
Maryland Smokeless Coal Co.		4,525	25	----	----	4,500
Totals		103,207	598	2,732	4,704	95,173

For the Year Ending June 30, 1901.

Name of Company	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
F. P. Rease	Randolph	81,658	110	1,071	---	80,477
Junior Coal Co.	Harding	47,296	122	246	17,207	29,721
Maryland Smokeless Coal Co.	Weaver	38,929	446	712	---	37,771
Totals		167,883	678	2,029	17,207	147,969

For the Year Ending June 30, 1902.

Name of Company	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Junior Coal Co.	Womelsdorff	83,739	---	----	---	83,739
Junior Coal Co.	Harding	66,770	351	276	28,393	37,750
Maryland Smokeless Coal Co.	Weaver Nos. 1 & 2	115,178	1,784	184	22,075	91,135
Totals		265,687	2,135	460	50,468	212,624

For the Year Ending June 30, 1903.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	DISTRIBUTION OF COAL. Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Junior Coal Co.	Coalton Nos. 1 & 2	108,045	48	1,108	----	106,889
Junior Coal Co.	Grassy Run	3,379	----	----	----	3,379
Junior Coal Co.	Harding	94,529	382	364	50,746	43,037
Maryland Smokeless Coal Co.	Weaver No. 1	95,326	1,607	2,410	63,125	28,184
Maryland Smokeless Coal Co.	Weaver No. 2	75,589	----	----	45,000	30,589
Maryland Smokeless Coal Co.	Weaver No. 3	3,219	100	----	----	3,119
Ritter Coal Co.	Klondyke	8,400	----	----	----	8,400
Totals		388,487	2,137	3,882	158,871	223,597

For the Year Ending June 30, 1904.

Name of Company.	Name of Mine.	Production of Coal.	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Davis Colliery Co.	Coalton	105,981	2,476	1,753	13,418	88,334
Davis Colliery Co.	Grassy Run	7,790	6	16	----	7,768
Davis Colliery Co.	Harding	94,743	716	446	43,313	50,268
Maryland Smokeless Coal Co.	Weaver No. 1	82,861	1,629	678	22,678	57,876
Maryland Smokeless Coal Co.	Weaver No. 2	42,646	97	----	20,735	21,814
Maryland Smokeless Coal Co.	Weaver No. 3	7,855	----	----	----	7,855
Maryland Smokeless Coal Co.	Leiter No. 1	11,181	446	268	----	10,467
Ritter Coal Co.	Klondyke	3,474	100	450	----	2,924
Totals		356,531	5,470	3,611	100,144	247,306

For the Year Ending June 30, 1905.

Name of Company.	Name of Mine.	Production of Coal.	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Davis Colliery Co.	Coalton	160,297	1,957	1,004	52,963	104,373
Davis Colliery Co.	Harding	89,188	3,010	583	39,334	46,261
Davis Coal & Coke Co.	Weaver No. 1	120,379	1,283	1,713	64,300	53,083
Davis Coal & Coke Co.	Weaver No. 2	43,965	66	79	34,286	9,534
Davis Coal & Coke Co.	Weaver No. 3	2,005	---	---	---	2,005
Ritter Coal Co.	Klondyke	1,000	---	10	---	990
Totals		416,834	6,316	3,389	190,883	216,246

For the Year Ending June 30, 1906.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	DISTRIBUTION OF COAL. Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Davis Colliery Co.	Colliery No. 1	225.929	2,155	1,119	107,274	115,381
Davis Colliery Co.	Colliery No. 2	118,542	2,074	525	51,961	63,982
Davis Coal & Coke Co.	Weaver No. 1	137,860	1,635	859	93,658	41,708
Davis Coal & Coke Co.	Weaver No. 2	77,512	48	---	51,037	26,427
W. H. Green	Klondyke	9,600	---	150	---	9,450
Totals		569,443	5,912	2,653	303,930	256,948

For the Year Ending June 30, 1907.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Davis Colliery Co.	No. 1	232,191	2,560	994	117,925	110,712
Davis Colliery Co.	No. 3	136,260	2,168	520	43,322	90,250
Davis Coal & Coke Co.	No. 1	135,769	1,719	517	104,588	28,945
Davis Coal & Coke Co.	No. 2	78,362	248	159	54,527	23,428
Davis Colliery Co.	No. 5	6,798	300	82	---	6,416
W. H. Green	Klondyke	20,000	---	---	---	20,000
Totals		609,380	6,995	2,272	320,362	279,751

For the Year Ending June 30, 1908.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Davis Coal & Coke Co.	Weaver No. 1	99,577	1,640	622	41,471	55,844
Davis Coal & Coke Co.	Weaver No. 2	67,482	425	---	22,981	44,076
Davis Coal & Coke Co.	Leiter No. 5	5,239	191	70	---	4,978
Davis Colliery Co.	Coalton No. 1	196,464	1,394	531	70,079	124,460
Davis Colliery Co.	Sivad No. 2	22,722	83	127	---	22,512
Davis Colliery Co.	Harding No. 3	130,383	2,301	441	33,765	93,876
Davis Colliery Co.	West Harding No. 5	6,080	20	---	---	6,060
W. H. Green	Klondyke	17,856	---	358	---	17,498
Totals		545,803	6,054	2,149	168,296	369,304

For the Year Ending June 30, 1909.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	DISTRIBUTION OF COAL.			
			Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Davis Coal & Coke Co.	Weaver No. 1	101,416	1,640	428	31,116	68,232
Davis Coal & Coke Co.	Weaver No. 2	79,183	683	---	20,593	57,907
Davis Colliery Co.	Coalton No. 1	151,039	2,680	958	69,915	77,486
Davis Colliery Co.	Sivad No. 2	7,800	100	72	---	7,628
Davis Colliery Co.	Harding No. 3	105,441	2,340	731	41,495	60,875
Davis Colliery Co.	Harding No. 5	9,399	---	----	---	9,399
W. H. Green (Lessee)	Klondyke	8,928	88	90	---	8,750
Totals		463,206	7,531	2,279	163,119	290,277

For the Year Ending June 30, 1910.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Davis Coal & Coke Co.	Weaver No. 1	152,782	1,782	694	50,053	100,253
Davis Coal & Coke Co.	Weaver No. 2	145,300	580	---	25,328	119,392
Davis Colliery Co.	Coalton No. 1	191,716	3,296	1,088	113,211	74,121
Davis Colliery Co.	Sivad No. 2	24,777	48	92	---	24,637
Davis Colliery Co.	Harding North and Harding No. 3	142,946	2,348	673	49,712	90,213
Davis Colliery Co.	West Harding No. 5	11,597	---	---	---	11,597
W. H. Green (Lessee)	Klondyke	16,000	---	1,000	---	15,000
Brady Coal Co.	Klondyke	6,112	20	26	---	6,066
W. Va. Pulp & Paper Co.	Hopkins	9,060	89	8,260	---	711
Totals		700,290	8,163	11,833	238,304	441,990

For the Year Ending June 30, 1911.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	DISTRIBUTION OF COAL.			
			Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Davis Coal & Coke Co.	Weaver No. 1.	135,291	1,913	243	6,094	127,041
Davis Coal & Coke Co.	Weaver No. 2	113,383	609	412	3,610	108,752
Davis Coal & Coke Co.	Weaver No. 3	76,489	350	59	---	76,080
Davis Colliery Co.	Coalton No. 1	208,206	2,867	1,162	111,741	92,436
Davis Colliery Co.	Sivad No. 2	41,861	128	162	---	41,571
Davis Colliery Co.	Harding No. 3	139,585	2,643	655	43,532	92,755
Davis Colliery Co.	West Harding No. 5	13,904	---	----	---	13,904
W. H. Green	Leroy No. 1	10,000	---	----	---	10,000
Brady Coal Co.	Klondyke	20,213	39	195	---	19,979
W. Va. Pulp & Paper Co.	Spruce Knob	9,627	---	9,627	---	---
Rich Mountain Coal Co.	Beech Run	5,463	---	---	---	5,463
Rich Mountain Coal Co.	Hartridge	9,640	200	600	2,800	6,040
J. B. Jenkins Coal & Coke Co.	Mabie No. 1	5,000	---	50	---	4,950
Totals		788,662	8,749	13,165	167,777	598,971

For the Year Ending June 30, 1912.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Davis Coal & Coke Co.	Weaver No. 1	131,496	1,885	759	---	128,852
Davis Coal & Coke Co.	Weaver No. 2	127,791	812	----	---	126,979
Davis Colliery Co.	Coalton No. 1	201,832	3,309	1,091	111,727	85,705
Davis Colliery Co.	Sivad No. 2	38,776	138	248	----	38,390
Davis Colliery Co.	Harding No. 3	107,262	2,298	559	40,777	63,628
Davis Colliery Co.	Sivad No. 5	13,278	---	---	---	13,278
Brady Coal Co.	Klondyke No. 1	26,251	204	---	---	26,047
W. Va. Pulp & Paper Co.	Hopkins No. 1	13,269	---	---	---	13,269
J. B. Jenkins Coal & Coke Co.	Jenkins No. 1	25,685	100	50	---	25,535
W. H. Green	Leroy No. 1	15,000	---	----	---	15,000
Rich Mountain Coal Co.	Hartridge Nos. 1-2	5,424	---	1,689	---	3,735
Rich Mountain Coal Co.	Beech Run Nos. 1-2	10,568	---	200	---	10,368
Totals		716,632	8,746	4,596	152,504	550,786

For the Year Ending June 30, 1913.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	Distribution of Coal. Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Davis Coal & Coke Co.	Weaver No. 1	101,278	1,705	770	----	98,803
Davis Coal & Coke Co.	Weaver No. 2	133,782	774	---	----	133,008
Davis Colliery Co.	Coalton Nos. 1 and 3	243,172	5,802	1,120	176,242	60,008
Davis Colliery Co.	Sivad No. 2	39,035	126	88	---	38,821
Davis Colliery Co.	Harding No. 3	102,367	2,384	619	43,127	56,237
Davis Colliery Co.	No. 5	15,598	---	174	---	15,424
Rich Mountain Coal Co.	Hartridge	8,000	---	200	---	7,800
Rich Mountain Coal Co.	Beech Run	12,000	---	---	---	12,000
J. B. Jenkins Coal & Coke Co.	Jenkins	25,950	---	51	---	25,899
W. Va. Pulp & Paper Co.	Hopkins No. 1	11,890	93	---	---	11,797
W. H. Green	W. H. Green	25,000	300	200	---	24,500
Brady Coal Co.	Brady	23,495	---	125	---	23,370
Totals		741,567	11,184	3,347	219,369	507,667

For the Year Ending June 30, 1914.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	Distribution of Coal. Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Davis Coal & Coke Co.	Weaver No. 1	74,825	1,426	864	----	72,535
Davis Coal & Coke Co.	Weaver No. 2	126,952	650	30	---	126,272
Davis Colliery Co.	Coalton Nos. 1 & 3	230,252	6,098	1,222	143,635	79,297
Davis Colliery Co.	Sivad No. 2	52,804	144	---	---	52,660
Davis Colliery Co.	Sivad No. 5	18,080	---	154	---	17,926
Davis Colliery Co.	Harding Nos. 1, 3 & 5	118,928	2,366	707	50,672	65,183
Green Coal Co., W. H.	Leroy No. 1	1,000	---	---	---	1,000
Humphreys, A. M., Rec., Brady Coal Co.	Klondyke	24,808	---	224	---	24,584
Jenkins Coal & Coke Co., J. B.	Ariana	60,000	50	200	---	59,750
Rich Mountain Coal Co.	Hartridge	6,005	318	129	---	5,558
Rich Mountain Coal Co.	Beech Run	5,231	90	170	---	4,971
W. Va. Pulp & Paper Co.	Hopkins	18,833	125	---	---	18,708
Totals		737,718	11,267	3,700	194,307	528,444

For the Year Ending June 30, 1915.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	DISTRIBUTION OF COAL. Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Brady Coal Company	Klondyke	11,360	---	110	----	11,250
Davis Coal & Coke Co.	Weaver No. 1	55,426	1,055	559	----	53,812
Davis Coal & Coke Co.	Weaver No. 2.	89,733	518	---	----	89,215
Davis Colliery Company	Coalton	161,518	5,584	1,114	57,055	97,765
Davis Colliery Company	Harding	110,438	2,318	624	28,922	78,574
Davis Colliery Company	Sivad No. 2	23,275	84	24	---	23,167
Davis Colliery Company	Coaling Station	15,408	----	146	---	15,262
Green, W. H.	Williette	25,000	----	---	---	25,000
Jenkins Coal & Coke Co., J. B.	Ariana	34,535	288	298	---	33,949
W. Va. Pulp & Paper Co.	Hopkins	23,415	42	---	---	23,373
Totals		550,108	9,889	2,875	85,977	451,367

For the Year Ending June 30, 1916.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	DISTRIBUTION OF COAL. Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Brady, A. Spates	Brady	22,014	----	77	----	21,937
Brady Coal Co.	Brady	1,415	----	---	----	1,415
Davis Coal & Coke Co., The	Weaver No. 1	26,442	132	496	----	25,814
Davis Coal & Coke Co., The	Weaver No. 2	88,167	536	---	----	87,631
Davis Colliery Co.	Coalton No. 2 & 3	240,194	6,676	1,168	100,933	131,417
Davis Colliery Co.	Harding Nos. 1, 3, & 4	145,385	2,522	663	45,061	97,139
Davis Colliery Co.	Sivad Nos. 1 & 3	50,990	115	178	---	50,697
Davis Colliery Co.	West Harding	16,004	---	4	---	16,000
Green, W. H.	Williette Nos. 1 & 2	16,500	5	150	---	16,345
J. B. Jenkins Coal & Coke Co., The	Ariana	54,488	397	212	---	53,879
W. Va. Pulp & Paper Co.	Hopkins	22,957	70	---	---	22,887
Totals		684,556	10,453	2,948	145,994	525,161

For the Year Ending June 30, 1917.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	DISTRIBUTION OF COAL. Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
A. Spates Brady	Brady	38,512	---	136	---	38,376
Davis Coal & Coke Co., The	No. 1	10,113	8	655	---	9,450
Davis Coal & Coke Co., The	No. 2	65,300	416	36	---	64,848
J. B. Jenkins Coal & Coke Co., The	Ariana	57,853	630	223	---	57,000
Moore-Keppel & Co.	Cassity	5,920	---	5,505	---	415
West Va. Coal & Coke Co.	Coalton No. 1 Colliery	228,089	6,523	1,307	113,075	107,184
West Va. Coal & Coke Co.	Norton No. 2 Colliery	111,058	136	419	----	110,503
West Va. Coal & Coke Co.	Norton No. 3 Colliery	142,032	2,642	707	41,079	97,604
West Va. Coal & Coke Co.	No. 5 Colliery	20,501	---	5	---	20,496
W. Va. Pulp & Paper Co.	Randolph	29,260	65	---	---	29,195
Totals		708,638	10,420	8,993	154,154	535,071

For the Year Ending June 30, 1918.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Brady, A. Spates	Brady	46,834	----	211	---	46,623
Davis Coal & Coke Co.	No. 1	12,755	----	887	---	11,868
Davis Coal & Coke Co.	No. 2	66,838	484	10	---	66,344
J. B. Jenkins Coal & Coke Co., The	Ariana	61,650	1,000	298	---	60,352
Moore-Keppel & Co.	Cassity No. 1	2,408	----	2,408	---	---
Moore-Keppel & Co.	Cassity No. 2	817	----	---	---	817
Randolph Coal Co.	Randolph	14,213	----	---	---	14,213
Three Fork Coal Co.	Three Fork	8,519	----	1,941	---	6,578
West Va. Coal & Coke Co.	No. 1 Colliery	208,601	5,719	1,832	120,958	80,092
West Va. Coal & Coke Co.	Norton No. 2 Colliery	228,386	---	1,507	---	226,879
West Va. Coal & Coke Co.	No. 3	118,409	3,868	660	36,885	76,996
West Va. Coal & Coke Co.	No. 5 Coaling Station	25,055	----	7	---	25,048
West Va. Coal & Coke Co.	No. 6	40,701	----	332	---	40,369
West Va. Pulp & Paper Co.	Hopkins	39,574	----	---	---	39,574
Totals		874,760	11,071	10,093	157,843	695,753

For the Year Ending June 30, 1919.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	DISTRIBUTION OF COAL. Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Brady, A. Spates	Brady	38,761	---	230	---	38,531
Davis Coal & Coke Co.	No. 1	5,334	---	339	---	4,995
Davis Coal & Coke Co.	No. 2	41,901	337	91	---	41,473
Davis Coal & Coke Co.	No. 5	16,063	---	29	---	16,034
Davis Coal & Coke Co.	No. 7	215	10	---	---	205
Davis Coal & Coke Co.	No. 8	3,174	183	---	---	2,991
J. B. Jenkins Coal & C. Co.	Ariana	40,713	509	224	---	39,980
Randolph Coal Co.	Randolph No. 1	17,094	---	---	---	17,094
Three Fork Coal Co.	Midvale	23,314	960	5,605	---	16,749
West Va. Coal & Coke Co.	Coalton No. 1	167,407	4,220	1,611	99,589	61,987
West Va. Coal & Coke Co.	Colliery No. 6	94,119	23	400	---	93,696
West Va. Coal & Coke Co.	Harding No. 3	104,115	4,593	676	30,120	68,726
West Va. Coal & Coke Co.	Norton No. 2	254,474	---	1,552	---	252,922
West Va. Coal & Coke Co.	No. 5 Coaling Station	8,711	---	---	---	8,711
West Va. Pulp & Paper Co.	Hopkins	31,862	---	---	---	31,862
Totals		847,257	10,835	10,757	129,709	695,956

For the Year Ending June 30, 1920.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Brady, A. Spates	Brady	66,884	---	232	---	66,652
Davis Coal & Coke Co., The	Weaver No. 2	34,775	317	335	---	34,123
Davis Coal & Coke Co., The	No. 5	8,420	---	---	---	8,420
Randolph Colliery Co.	Norton	6,340	---	---	---	6,340
Three Fork Coal Co.	Three Fork	13,493	781	3,128	---	9,584
West Va. Coal & Coke Co.	Coalton No. 1	160,247	8,312	1,569	59,596	90,770
West Va. Coal & Coke Co.	Norton No. 2	250,960	---	1,259	---	249,701
West Va. Coal & Coke Co.	Harding No. 3	82,724	5,477	630	22,313	54,304
West Va. Coal & Coke Co.	No. 5	7,000	---	---	---	7,000
West Va. Coal & Coke Co.	Mabie No. 6	86,489	51	523	---	85,915
West Va. Coal & Coke Co	Mabie No. 7	15,852	135	80	---	15,637
West Va. Pulp & Paper Co.	Hopkins	37,464	---	---	---	37,464
West Va. Pulp & Paper Co.	Linan	19,294	---	---	---	19,294
Totals		789,942	15,073	7,756	81,909	685,204

For the Year Ending June 30, 1921.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	DISTRIBUTION OF COAL. Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Beaver Creek Coal Co.	Beaver Creek No. 2	9,111	86	125	---	8,900
Brady, A. Spates	Brady	47,023	---	116	---	46,907
Davis Coal & Coke Co.	Weaver No. 2	24,539	183	180	---	24,176
Randolph Colliery Co.	Randolph	45,614	---	---	---	45,614
Three Fork Coal Co.	Three Fork	9,474	245	2,948	---	6,281
West Va. Coal & Coke Co.	Coalton No. 1	127,393	6,729	1,182	38,224	81,258
West Va. Coal & Coke Co.	Norton No. 2	283,831	998	1,586	---	281,247
West Va. Coal & Coke Co.	Harding No. 3	51,547	5,270	467	11,313	34,497
West Va. Coal & Coke Co.	Norton No. 5	8,103	---	---	---	8,103
West Va. Coal & Coke Co.	Mabie No. 6	74,594	53	333	---	74,208
West Va. Coal & Coke Co.	Mabie No. 7	35,004	45	119	---	34,840
West Va. Pulp & Paper Co.	Hopkins	41,700	---	---	---	41,700
West Va. Pulp & Paper Co.	Linan	17,936	---	---	---	17,936
Totals		775,869	13,609	7,056	49,537	705,667

For the Year Ending June 30, 1922.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Beaver Creek Coal Co.	Beaver Creek	7,243	100	---	---	7,143
Brady, A. Spates	Brady	2,841	---	127	---	2,714
Bruce B. Stone Coal Co.	Quality No. 1	3,000	---	---	---	3,000
Davis Coal & Coke Co.	Weaver No. 2	2,040	19	---	---	2,021
Randolph Colliery Co.	Randolph	17,767	---	---	---	17,767
Three Fork Coal Co.	Three Fork	6,752	346	2,527	---	3,879
West Va. Coal & Coke Co	Coalton No. 1	49,325	5,587	770	---	42,968
West Va. Coal & Coke Co	Norton No. 2	214,474	388	1,121	---	212,965
West Va. Coal & Coke Co	Harding No. 3	2,266	326	29	---	1,911
West Va. Coal & Coke Co	No. 5 Coaling Station	4,316	---	---	---	4,316
West Va. Coal & Coke Co	Mabie No. 6	512	---	---	---	512
West Va. Pulp & Paper Co.	Hopkins	41,022	---	---	---	41,022
West Va. Pulp & Paper Co.	Linan	18,172	655	---	---	17,517
Totals		369,730	7,421	4,574	---	357,735

For the Year Ending June 30, 1923.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	DISTRIBUTION OF COAL. Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Beaver Creek Coal Co.	Beaver Creek	11,378	---	---	---	11,378
Brady, A. Spates	Brady	37,235	---	173	---	37,062
Davis Coal & Coke Co., The	Weaver No. 2	33,337	227	69	---	33,041
Randolph Colliery Co.	Randolph	19,703	---	---	---	19,703
Three Fork Coal Co.	Three Fork	18,097	913	4,946	---	12,238
West Virginia Coal & Coke Co.	Coalton No. 1	83,971	7,228	688	53,011	23,044
West Virginia Coal & Coke Co.	Harding No. 3	57,571	4,142	658	19,796	32,975
West Virginia Coal & Coke Co.	Mabie No. 6	39,364	7	169	---	39,188
West Virginia Coal & Coke Co.	Norton No. 2	303,956	235	1,519	---	302,202
West Virginia Coal & Coke Co.	No. 5 Coaling Station	5,782	---	---	---	5,782
West Va. Pulp & Paper Co.	Big John	7,829	---	---	---	7,829
West Va. Pulp & Paper Co.	Deer Lick	9,789	---	---	---	9,789
West Va. Pulp & Paper Co.	Hopkins	52,419	---	---	---	52,419
West Va. Pulp & Paper Co.	Linan	22,123	841	---	---	21,282
Totals		702,554	13,593	8,222	72,807	607,932

For the Year Ending June 30, 1924.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2240 lbs.)	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Beaver Creek Coal Co.	Beaver Creek No. 3	6,988	---	---	---	6,988
Brady, A. Spates	Brady	29,551	---	154	---	29,397
Davis Coal & Coke Co., The	Weaver No. 2	15,785	50	27	---	15,708
Randolph Colliery Co.	Randolph	5,000	---	---	---	5,000
Three Fork Coal Co.	Three Fork	29,982	1,790	6,844	---	21,348
West Va. Coal & Coke Co.	Coaling Station No. 5	5,994	---	---	---	5,994
West Va. Coal & Coke Co.	Coalton No. 1	47,202	9,774	850	15,157	21,421
West Va. Coal & Coke Co.	Harding No. 3.	14,,904	648	268	174	13,814
West Va. Coal & Coke Co.	Norton No. 2	324,165	495	1,803	---	321,867
West Va. Pulp & Paper Co.	Big John	6,403	---	---	---	6,403
West Va. Pulp & Paper Co.	Deer Lick	8,281	---	---	---	8,281
West Va. Pulp & Paper Co.	Hopkins	47,414	---	---	---	47,414
West Va. Pulp & Paper Co.	Linan	23,100	1,199	---	---	21,901
Totals		564,769	13,956	9,946	15,331	525,536

From July 1, 1924 to December 31, 1925.

Note: Change in Ton lbs.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2000 lbs.)	DISTRIBUTION OF COAL. Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Brady, A. Spates	Brady	66,586	---	242	---	66,344
Three Fork Coal Co.	Three Fork	38,270	1,988	8,519	---	27,763
Weaver Coal Company	Beaver Creek	13,848	---	---	---	13,848
West Va. Coal & Coke Co.	Coalton No. 1	28,088	3,500	367	7,315	16,906
West Va. Coal & Coke Co.	Harding No. 3	52,572	972	90	2,011	49,499
West Va. Coal & Coke Co.	Leiter No. 5	11,957	---	3,459	---	8,498
West Va. Coal & Coke Co.	Mabie No. 6	1,671	---	---	---	1,671
West Va. Coal & Coke Co.	Norton No. 2	605,652	70	4,540	---	601,042
W. Va. Pulp & Paper Co.	Hopkins	33,355	---	---	---	33,355
W. Va. Pulp & Paper Co.	Linan	12,560	711	---	---	11,849
Totals		864,559	7,241	17,217	9,326	830,775

For the Calendar Year 1926.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2000 lbs.)	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Brady, A. Spates	Brady	56,042	---	90	---	55,952
Davis Coal & Coke Co., The	Weaver No. 2	1,225	---	---	---	1,225
Three Fork Coal Co.	Three Fork	20,377	1,156	5,035	---	14,186
W. Va. Coal & Coke Co.	Coalton No. 1	74,441	3,477	793	45,613	24,558
W. Va. Coal & Coke Co.	Harding No. 3	84,005	4,608	983	5,160	73,254
W. Va. Coal & Coke Co.	Leiter No. 5	9,742	---	---	---	9,742
W. Va. Coal & Coke Co.	Mabie No. 6	2,135	---	8	---	2,127
W. Va. Coal & Coke Co.	Norton No. 2	368,947	---	2,681	---	366,266
W. Va. Pulp & Paper Co.	Hopkins	22,188	---	---	---	22,188
Totals		639,102	9,241	9,590	50,773	569,498

For the Calendar Year 1927.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2000 lbs.)	DISTRIBUTION OF COAL. Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Brady, A. Spates	Brady	36,495	---	145	---	36,350
Davis Coal & Coke Co., The	Weaver No. 2	2,452	---	8	---	2,444
Three Fork Coal Co.	Three Fork	22,210	1,196	4,047	---	16,967
Walkers New River Mining Co.	Big Sewell No. 1	5,825	---	----	---	5,825
West Va. Coal & Coke Co.	Coalton	82,081	5,631	659	24,293	51,498
West Va. Coal & Coke Co.	Harding	75,927	6,708	805	2,819	65,595
West Va. Coal & Coke Co.	Leiter No. 5	10,100	---	10,100	---	---
West Va. Coal & Coke Co.	Norton	329,035	---	1,648	---	327,387
West Va. Pulp & Paper Co.	Hopkins	23,231	---	----	---	23,231
Totals		587,356	13,535	17,412	27,112	529,297

For the Calendar Year 1928.

Name of Company.	Name of Mine.	Production of Coal. (Tons of 2000 lbs.)	Used in Operation of Mine.	Furnished local trade and tenants.	Used in coke ovens.	Shipped from mine.
Brady, A. Spates	Brady	25,218	---	110	---	25,108
Davis Coal Land Co.	Cheat Nos. 1 & 2	7,348	---	----	---	7,348
Monsarrat & Co., Inc.	Monsarrat No. 4	11,927	210	130	---	11,587
Three Fork Coal Co	Three Fork	31,832	1,320	4,117	---	26,395
Walkers New River Mining Co.	Big Sewell No. 1	25,199	150	30	---	25,019
West Va. Coal & Coke Co.	Coalton	21,978	5,423	483	---	16,072
West Va. Coal & Coke Co.	Harding	38,998	6,167	522	930	31,379
West Va. Coal & Coke Co.	Leiter	7,728	---	----	---	7,728
West Va. Coal & Coke Co.	Norton	258,623	1,021	1,970	---	255,632
W. Va. Pulp & Paper Co.	Hopkins	19,378	---	----	---	19,378
Totals		448,229	14,291	7,362	930	425,646

RECORDS OF COAL TEST BORINGS.

SUMMARIZED COAL TEST RECORDS.

Within the limits of Randolph County there is positive knowledge that 68 holes have been bored for coal and that another is located in Upshur County immediately adjacent to the Randolph line, making 69 which are of pertinent interest. There are also several in Tucker County near Laneville that have bearing on the coal resources of Randolph County. Some of these were made with the diamond drill and others with the churn drill. The accurate locations and surface elevations of all these borings have been secured from the operators or other interested parties. It is commonly reported, also, that a few additional shallow holes have been drilled through the Middle and Lower Kittanning Coal in Roaring Creek District, but if true the writer was unable to find them, either through the services of a local guide or in the maps and files of the company or companies which made them.

The following table, while lacking some of the details that it should contain, gives the surface elevations and ownership of all coal test borings of which positive locations could be obtained, and the condensed records of such as could be secured. The first column gives the key number on Map II, by which the position of the borings may be found, and in the elevation column the letter "L" signifies a hand-level determination, and the letter "B" indicates that an aneroid barometer was used, checked on the nearest Government elevation. The following abbreviations of company names have been used:

Alex. B. & L.	Alexander Boom and Lumber Company.
A. Wood I. & S	Alan Wood Iron and Steel Company.
Berwind-White	Berwind-White Coal Mining Company.
Beth. Steel	Bethlehem Steel Corporation.
Buckhannon Chem.	Buckhannon Chemical Company.
Cutright Bros.	Cutright Brothers.
Davis C. & C.	Davis Coal and Coke Company.
Davis Col. (WVC&C)	Davis Colliery Company (West Virginia Coal and Coke Company).
Elkhorn	Elkhorn Coal Corporation.
Elkins Electric Ry.	Elkins Electric Railway Company.
Holly Lumber	Holly Lumber Company.
Steele et al.	George M. Steele and others.
Western Md. Ry.	Western Maryland Railway Company.
W. Va. C. & C.	West Virginia Coal and Coke Company.
W. Va. P. & P.	West Virginia Pulp and Paper Company.

DETAILED COAL TEST RECORDS, ROARING CREEK DISTRICT.

In Roaring Creek District positive evidence of the drilling of 13 coal test holes was obtained and it is commonly reported that there were several other shallow holes on the land of the West Virginia Coal and Coke Company west of Coalton and Mabie but, if so, they could not be found in the company office at Elkins and could not be located on the ground even with the services of a local guide. Aside from the uncertain number not actually located several were found which could not be identified as to numbers and on which no records could be obtained. Of the 13 holes actually located the detailed or partial records of only five were secured, some of which have been published in previous pages in connection with the measured sections of Chapter V, and some of which will now be given.

The three following records of holes located on the western slope of Rich Mountain, only one of which reached the Sewell Coal, were furnished the Survey several years ago by Mr. M. D. Kirk, of the Davis Coal and Coke Company:

James Curtis No. 1 (1) Coal Test Boring.

Roaring Creek District; on a branch of Roaring Creek, 1.5 miles southeast of Norton, (Roaring Creek Junction); authority, Davis Coal and Coke Company; elevation, 2250′ B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Surface	5	6	5	6
Sandstone, Upper Connoquenessing	38	2	43	8
Shale, Quakertown, light	1	11	45	7
Coal, Quakertown	1	6	47	1
Fire clay	1	0	48	1
Shale, light, sandy	4	5	52	6
Shale, dark, sandy	16	0	68	6
Sandstone, with coal spars	2	2	70	8
Shale, dark	0	5	71	1
Sandstone	8	6	79	7
Shale, dark	0	2	79	9
Sandstone, with coal spars	25	4	105	1
Shale, dark	1	0	106	1
Sandstone	1	6	107	7
Slate, black	4	6	112	1
Shale, hard, sandy	0	10	112	11
Slate, dark	7	0	119	11
Sandstone	0	6	120	5
Black slate	1	0	121	5
Shale, dark, sandy	1	6	122	11
Fire clay, bastard	1	6	124	5
Shale, dark, sandy, hard	22	8	147	1
Sandstone	4	6	151	7
Shale, dark	2	0	153	7
Sandstone	6	6	160	1

Summarized Record of Tests for

No. on Map.	Name of Property.	Magisterial District	Company	Surface Elevation.	Campbell Creek (Peerless) Coal. Depth Top.	Campbell Creek (Peerless) Coal. Thickness Feet.
1	James Curtis No. 1	Roaring Creek	Davis C. & C.	2250B	....	..
2	Maxwell & Crawford No. 2	Roaring Creek	Davis C. & C.	2500B	....	..
3	Maxwell & Crawford No. 3	Roaring Creek	Davis C. & C.	2540B	151.5	0.7
4	W. Va. C. & C. Co. No.	Roaring Creek	W. Va. C. & C.	2700B	....	..
5	W. Va. C. & C. Co. No.	Roaring Creek	W. Va. C. & C.	2225B	....	..
6	W. Va. C. & C. Co. No.	Roaring Creek	W. Va. C. & C.	2585B	....	..
7	W. Va. C. & C. Co. No.	Roaring Creek	W. Va. C. & C.	2265B	....	..
8	W. Va. C. & C. Co. No.	Roaring Creek	W. Va. C. & C.	2180B	....	..
9	George Phillips No. 1	Roaring Creek	W. Va. C. & C.	2373L	....	..
10	J. J. Phillips No. 1	Roaring Creek	Davis Col. (WVC&C)	2470B	....	..
11	J. J. Phillips No. 2	Roaring Creek	W. Va. C. & C.	2405B	....	..
12	John O'Connor No. 1	Roaring Creek	W. Va. C. & C.	2270B	....	..
13	P. J. Cain No. 1	Roaring Creek	P. J. Cain	1849L	26.5	1.4
14	Geo. M. Steele No. 1	Washington (Upshur)	Steele et al.	1855B	....	..
15	Andrew Currence No. 11	Middle Fork	Davis Col. (WVC&C)	2092B	....	..
16	Cassity Fork B. & L. Co. No. 1	Middle Fork	A. Wood I. & S.	2520B	351.3	2.3
17	Cassity Fork B. & L. Co. No. 2	Middle Fork	A. Wood I. & S.	2145B	14.5	2.3
18	Cassity Fork B. & L. Co. No. 3	Middle Fork	A. Wood I. & S.	2765B	....	..
19	Womelsdorff Hrs. No. 12	Middle Fork	Davis Col. (WVC&C)	2170B	....	..
20	John Fincham No. 14	Middle Fork	Davis Col. (WVC&C)	2214L	....	..
21	K. E. Ziekefoose No. 13	Middle Fork	Davis Col. (WVC&C)	2323L	....	..
22	Elkhorn Coal Corp. No. 1	Middle Fork	Elkhorn	2340B	....	..
23	Elkhorn Coal Corp. No. 2	Middle Fork	Elkhorn	2865B	....	..
24	Alex. B. & L. Co. No. 1	Middle Fork	Alex. B. & L.	2955B	....	..
25	Elkhorn Coal Corp. No. 1	Middle Fork	Elkhorn	3175B	....	..
26	Elkhorn Coal Corp. No. 2	Middle Fork	Elkhorn	3175B	....	..
27	Elkhorn Coal Corp. No. 3	Middle Fork	Elkhorn	3350B	....	..
28	Elkhorn Coal Corp. No. 4	Middle Fork	Elkhorn	2945B	....	..
29	Elkhorn Coal Corp. No. 5	Middle Fork	Elkhorn	2945B	....	..
30	Elkhorn Coal Corp. No. 6	Middle Fork	Elkhorn	.....	....	..
31	Elkhorn Coal Corp. No. 7	Middle Fork	Elkhorn	2870B	....	..
32	Elkhorn Coal Corp. No. 8	Middle Fork	Elkhorn	2935B	....	..
33	Elkhorn Coal Corp. No. 9	Middle Fork	Elkhorn	3055B	....	..
34	Buckhannon Chem. Co. No. 1	Middle Fork	Buckhannon Chem.	1905B	....	..
35	J. A. McCauley No. 1	Middle Fork	Cutright Bros.	2335B	....	..
36	Holly Lumber Co. No. 1	Middle Fork	Holly Lumber	2690B	....	..
37	Thomas No. 1	Middle Fork	Beth. Steel	2650B	....	..
38	Pickens No. 2	Middle Fork	Beth. Steel	3015B	....	..
39	Shock No. 3	Middle Fork	Beth. Steel	3310B	96.4	..
40	Winkler No. 4	Middle Fork	Beth. Steel	3400B	....	..
41	Joseph Phenecie No. 1	New Interest	....	1975B	....	..
42	Davis Coal & Coke Co. No. 1	Leadsville	Davis C. & C.	1920B	....	..
43	Susan Darby No. 1	Leadsville	Davis C. & C.	2365B	157.7	3.6
44	Susan Darby No. 2	Leadsville	Davis C. & C.	2430B	....	..
45	Coberly No. 1	Leadsville	Western Md. Ry.	1750B	....	..
46	W. Va. C. & C. Co. No. 1	Leadsville	Davis Col. (WVC&C)	1945B	....	..
47	W. Va. C. & C. Co. No. 2	Leadsville	Davis Col. (WVC&C)	1939L	....	..
48	Wm. Corley No. 9	Leadsville	Davis Col. (WVC&C)	1858L	136.2	0.6
49	Elkins Electric Ry. Co. No. 1	Leadsville	Elkins Electric Ry.	2060B	....	..
50	W. Va. P. & P. Co. No. 1A	Huttonsville	W. Va. P. & P.	4330B	....	..
51	W. Va. P. & P. Co. No. 2	Huttonsville	W. Va. P. & P.	3920B	....	..
52	W. Va. P. & P. Co. No. 3	Huttonsville	W. Va. P. & P.	4268L	59.0	1.5
53	W. Va. P. & P. Co. No. 4	Huttonsville	W. Va. P. & P.	4046L	....	..
54	W. Va. P. & P. Co. No. 5	Huttonsville	W. Va. P. & P.	3953L	....	..
55	W. Va. P. & P. Co. No. 6	Huttonsville	W. Va. P. & P.	3785B	....	..
56	W. Va. P. & P. Co. No. 7	Huttonsville	W. Va. P. & P.	3655B	....	..
57	W. Va. P. & P. Co. No. 8	Huttonsville	W. Va. P. & P.	4215B	122.1	0.6
58	W. Va. P. & P. Co. No. 8A	Huttonsville	W. Va. P. & P.	3982B	....	..
59	W. Va. P. &. P. Co. No. 8B	Huttonsville	W. Va. P. & P.	3826B	....	..
60	W. Va. P. & P. Co. No. 9	Huttonsville	W. Va. P. & P.	3610B	....	..
61	W. Va. P. & P. Co. No. 10	Huttonsville	W. Va. P. & P.	3940B	....	..
62	W. Va. P. & P. Co. No. 11	Huttonsville	W. Va. P. & P.	3710B	....	..
63	W. Va. P. & P. Co. No. 12	Huttonsville	W. Va. P. & P.	3988B	....	..
64	W. Va. P. & P. Co. No. 13	Huttonsville	W. Va. P. & P.	3615B	....	..
65	W. Va. P. & P. Co. No. 14	Huttonsville	W. Va. P. & P.	3585B	....	..
66	Ward & Hutton No. 2	Huttonsville	Berwind-White	3605B	....	..
67	Ward & Hutton No. 1	Mingo	Berwind-White	3780B	....	..
68	Ward & Hutton No. 3	Mingo	Berwind-White	3390B	....	..
69	W. Va. P. & P. Co. No. 1	Mingo	W. Va. P. & P.	4441B	....	..

Coal in Randolph County.

Eagle Coal.		Gilbert Coal.		Hughes Ferry Coal.		Castle Coal.		Sewell Coal.			Welch Coal.		Fire Creek Coal.			
Depth Top.	Thickness Feet.	Depth Top.	Thickness Feet.	Depth Top.	Thickness Feet.	Depth Top.	Thickness Feet.	Depth Top.	Thickness Feet.	Elevation of Base.	Depth Top.	Thickness Feet.	Depth Top.	Thickness Feet.	Total Depth Feet.	No. on Map.
197.2	6.9	228.7	2.0	249.1	2.8	....	..	....	..	.....	....	..	....	..	327.0	1
....	..	....	..	52.2	4.6	124.5	0.7	196.0	1.5	2302B	224.0	0.3	....	..	293.0	2
246.9	3.4	....	..	....	..	....	..	....	..	.....	....	..	....	..	255.0	3
....	..	....	..	....	..	....	..	429.0	3.4	2268B	....	..	....	..	....	4
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	5
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	6
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	7
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	8
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	9
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	10
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	11
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	12
70.0	0.2	139.8	0.4	197.9	0.3	....	..	340.4	0.9	1508L	....	..	....	..	563.5	13
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	14
....	..	....	..	....	..	....	..	9.0	3.2	2080B	137.6	0.3	....	..	295.8	15
446.9	1.4	487.0	0.5	....	..	....	..	664.3	0.3	1855B	....	..	....	..	783.0	16
'44.5	1.5	190.0	1.3	....	..	268.3	0.4	338.0	1.0	1806B	....	..	....	..	....	17
209.3	1.7	273.6	4.7	295.0	1.0	....	..	479.6	1.7	2284B	....	..	....	..	581.0	18
....	..	....	..	65.7	0.2	150.6	2.3	191.2	4.1	1975B	....	..	....	..	392.7	19
....	..	....	..	....	..	27.4	1.0	167.6	2.1	2044L	....	..	....	..	379.7	20
....	..	....	..	14.7	1.6	103.3	2.0	220.5	2.6	2100L	....	..	....	..	320.9	21
....	..	....	..	....	..	....	..	75.2	6.6	2258B	....	..	....	..	385.5	22
....	..	....	..	53.2	4.5	....	..	196.5	7.9	2661B	....	..	335.4	3.6	350.0	23
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	24
54.0	1.2	....	..	188.1	2.3	326.2	0.7	371.2	2.3	2801B	....	..	....	..	450.2	25
63.2	0.5	123.0	0.7	194.0	1.3	....	..	367.0	3.1	2805B	....	..	....	..	374.0	26
....	..	....	..	414.0	0.5	....	..	587.0	1.9	2761B	....	..	....	..	677.0	27
....	..	....	..	21.0	1.1	65.2	0.2	191.0	3.7	2751B	....	..	....	..	205.0	28
....	..	....	..	23.0	2.0	97.0	0.2	202.0	2.2	2741B	....	..	....	..	308.0	29
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	136.0	30
....	..	....	..	....	..	....	..	86.0	2.7	2781B	....	..	....	..	90.0	31
....	..	....	..	....	..	....	..	201.0	3.0	2731B	....	..	....	..	217.0	32
....	..	....	..	....	..	262.5	0.3	363.6	2.5	2689B	....	..	....	..	375.0	33
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	320.0	34
12.0	4.0	....	..	....	..	....	..	....	..	.....	....	..	....	..	16.0	35
56.0	4.0	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	36
168.0	..	....	..	....	..	....	..	467.9	..	2182B	509.7	..	549.0	..	605.0	37
126.6	..	....	..	....	..	....	..	432.1	..	2555B	460.2	..	522.6	..	552.0	38
251.3	..	....	..	....	..	....	..	537.7	..	2772B	579.5	..	612.4	..	689.0	39
107.4	..	....	..	....	..	....	..	420.0	..	2980B	475.0	..	585.9	..	610.0	40
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	41
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	42
266.2	6.0	....	..	....	..	....	..	445.4	2.0	1918B	....	..	....	..	447.4	43
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	473.4	44
203.8	2.0	....	..	....	..	....	..	....	..	.....	....	..	....	..	211.5	45
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	46
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	47
214.8	0.3	258.3	1.1	278.2	5.3	294.4	2.7	346.1	2.7	1509B	357.0	0.8	....	..	475.7	48
....	..	....	..	....	..	....	..	....	..	.....	39.0	1.5	....	..	150.0	49
65.0	2.5	130.8	2.3	302.9	2.2	346.6	0.6	383.4	7.5	3939B	414.5	2.5	548.6	1.2	556.8	50
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	309.2	51
199.2	2.2	....	..	....	..	....	..	....	..	.....	....	..	....	..	272.3	52
....	..	106.0	3.0	203.0	3.5	....	..	....	..	.....	....	..	....	..	258.5	53
....	..	30.0	3.0	131.0	9.7	186.7	1.8	226.5	2.6	3724L	....	..	....	..	232.1	54
....	..	....	..	....	..	....	..	....	..	.....	....	..	....	..	....	55
....	..	....	..	....	..	....	..	25.0	1.2	3629B	....	..	....	..	102.3	56
186.2	2.2	240.1	2.5	....	..	....	..	....	..	.....	....	..	....	..	259.0	57
....	..	....	..	116.2	1.6	155.2	0.8	227.8	4.4	3750B	271.8	1.0	....	..	384.0	58
....	..	....	..	....	..	29.0	0.5	106.2	4.5	3715B	....	..	....	..	112.8	59
....	..	....	..	133.5	0.8	187.3	1.1	263.2	1.7	3345B	291.9	0.8	....	..	512.7	60
....	..	322.2	1.2	....	..	....	..	....	..	.....	....	..	....	..	422.0	61
....	..	....	..	....	..	....	..	108.3	2.8	3599B	....	..	....	..	277.5	62
....	..	185.2	2.8	208.9	2.1	276.0	1.1	....	..	3711B	....	..	....	..	306.0	63
....	..	....	..	....	..	5.0	2.5	81.2	10.8	3523B	....	..	....	..	100.0	64
....	..	....	..	....	..	33.3	1.9	115.1	5.9	3464B	....	..	203.4	1.4	247.9	65
....	..	121.0	4.0	273.5	0.8	378.0	1.7	468.9	1.6	3135B	537.0	8.3	606.0	3.2	617.5	66
....	..	102.0	0.8	278.1	2.2	334.8	2.0	433.2	4.0	3343B	472.5	1.8	525.5	7.5	601.0	67
....	..	114.0	1.8	211.2	0.5	306.4	2.1	373.8	9.4	3007B	....	..	....	..	571.0	68
....	..	31.5	5.7	....	..	....	..	267.4	6.0	4168B	....	..	....	..	494.1	69

				Thickness. Ft.	In.	Total. Ft.	In.
Shale, dark				1	6	161	7
Sandstone with shale				3	0	164	7
Shale, dark, sandy				12	6	177	1
Sandstone with coal spars				9	2	186	3
Fine sandstone with slate				10	4	196	7
Shale and sandstone				0	8	197	3
Coal	0′	9″	Eagle	6	10	204	1
Sulphur	0	0½					
Coal	0	2½					
Coal and bone	0	6					
Slate	3	4					
Coal, bony	0	1½					
Slate	0	1					
Coal	1	8					
Coal, bony	0	1½					
Fire clay				1	3	205	4
Bastard fire clay				2	0	207	4
Sandstone with shale streaks				3	0	210	4
Sandstone, fine, light				16	0	226	4
Sandstone with light slate				0	7	226	11
Sandstone, fine, hard				1	9	228	8
Coal	0′	9″	Gilbert	2	0½	230	8½
Coal, bony	0	3½					
Fire clay				1	4½	232	1
Sandstone				0	7	232	8
Shale, dark, sandy				15	6	248	2
Black slate				0	11	249	1
Coal, bony	0′	3½″	Hughes Ferry	2	10	251	11
Slate	1	1½					
Coal, bony	0	3					
Coal	1	2					
Slate				0	6	252	5
Sandstone, hard	24′	9″	Harvey (?)	61	10	314	3
Sandstone with shale streaks	24	6					
Conglomerate sandstone	12	7					
Shale and sand mixed				12	9	327	0

Maxwell and Crawford No. 2 (2) Coal Test Boring.

Roaring Creek District; on a branch of Roaring Creek, 2.3 miles southeast of Norton (Roaring Creek Junction); authority, Davis Coal & Coke Co.; elevation, 2500′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface	18	0	18	0
Fire clay	5	6	23	6
Shale, dark, sandy	16	6	40	0
Sandstone with coal spars	7	0	47	0
Shale, dark, sandy	5	3	52	3

	Thickness. Ft.	In.	Total. Ft.	In.
Coal ---------0' 3"; Fire clay and shale 2 6; Bone ---------0 2; Coal ---------1 8½ — Hughes Ferry ----	4	7½	56	10½
Slate ----------	0	1½	57	0
Fire clay ----------	0	10	57	10
Slate and bone ----------	0	3	58	1
Fire clay ----------	0	7	58	8
Coal, Lower Iaeger ----------	0	5	59	1
Bone ----------	0	5	59	6
Fire clay ----------	0	9	60	3
Conglomerate sandstone, **Harvey**, with **coal** spars full of coarse pebbles ----	16	3	76	6
Shale, black ----------	11	6	88	0
Bone ----------	0	5	88	5
Black slate and **coal** spars ----------	0	3	88	8
Shale, dark ----------	18	4	107	0
Bone and black slate----------	1	7	108	7
Shale, dark, sandy ----------	15	11	124	6
Coal, Castle ----------	0	8	125	2
Fire clay ----------	6	2	131	4
Shale, dark, sandy ----------	11	8	143	0
Shale, gray, sandy ----------	5	9	148	9
Shale, dark ----------	2	3	151	0
Fire clay and sandstone ----------	3	6	154	6
Sandstone ----------	2	11	157	5
Shale, dark, sandy ----------	10	0	167	5
Fire clay ----------	2	3	169	8
Coal ---------0' 5"; Bone ---------0 3; **Coal** ---------0 10 — **Sewell "B"**	1	6	171	2
Fire clay ----------	1	6	172	8
Shale, dark, sandy ----------	23	4	196	0
Coal ---------0' 11"; Bone ---------0 7 — **Sewell --- (Sharon)**	1	6	197	6
Bastard fire clay ----------	3	6	201	0
Shale, dark, sandy, with sandstone streaks	23	0	224	0
Fire clay with **coal** spars, **Welch Coal** ----	0	4	224	4
Fire clay and shale ----------	2	8	227	0
Shale, dark, sandy, with sandstone streaks	5	6	232	6
Sandstone, hard ----10' 6"; Sandstone, coarse, pebbly, conglomerate ---------- 2 6; Sandstone, conglomerate ----------13 5; Shale, gray, sandy --11 7; Sandstone, hard, and gray shale ----- 3 0; Sandstone, hard---- 9 6 — **Upper Raleigh -- (Sharon)**	50	6	283	0
Shale, green ----------	7	0	290	0
Shale, red ----------	3	0	293	0

Maxwell and Crawford No. 3 (3) Coal Test Boring.

Roaring Creek District; on a branch of Roaring Creek, 1.7 miles northeast of Coalton; authority, Davis Coal & Coke Co.; elevation, 2540′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface and boulders	40	0	40	0
Sandstone, brown	3	0	43	0
Coal, bony, and slate, **Quakertown "Rider"**	0	2	43	2
Shale, dark 10′; Slate, black 3 } **Quakertown**	13	0	56	2
Coal, Quakertown	0	5	56	7
Fire clay with streaks	3	0	59	7
Fire clay	7	0	66	7
Shale, dark	2	0	68	7
Sandstone	20	0	88	7
Coal 1′ 11″; Fire clay 0 5; **Coal**, bony 0 2; **Coal** 0 1; Bony and slate 0 1; **Coal** 0 5 } **Cedar Grove**	3	1	91	8
Fire clay	0	4	92	0
Shale, gray	1	8	93	8
Sandstone	53	4	147	0
Sandstone with **coal** spars	0	3	147	3
Shale, dark	1	9	149	0
Fire clay	2	6	151	6
Coal, Campbell Creek (Peerless)	0	8	152	2
Fire clay, very soft	0	10	153	0
Shale, dark, sandy	1	4	154	4
Conglomerate sandstone with black pebbles	0	9	155	1
Shale, black	30	6	185	7
Shale, black, with sandstone pebbles	0	5	186	0
Shale, black	4	0	190	0
Fire clay, very soft	1	10	191	10
Shale, dark, sandy	0	10	192	8
Hard fire clay	2	4	195	0
Coal 1′ 8″; Fire clay 0 8; **Coal** 0 3; Fire clay with **coal** streaks 0 4; **Coal** 0 4; Bony and slate 0 6; **Coal** 0 4; Bony **coal** and slate 1 0 } **Powellton**	5	1	200	1
Fire clay	2	0	202	1
Slate, black, with **coal** bands	1	0	203	1
Slate, light, sandy, with **coal** slips	6	0	209	1
Fire clay	0	4	209	5
Shale, light, sandy	12	10	222	3
Sandstone	8	6	230	9

	Thickness. Ft.	In.	Total. Ft.	In.
Fire clay with coal slips	2	3	233	0
Conglomerate sandstone	1	2	234	2
Slate, black	1	10	236	0
Slate, black, with coal streaks	2	7	238	7
Shale, dark, sandy	8	4	246	11
Eagle: Bony coal 0′ 4″; Coal 0 10; Coal with sulphur bands 0 6; Coal 0 3½; Bone 0 2½; Coal 0 1; Bony and slate 0 4; Coal 0 1; Slate 0 1; Coal 0 2; Bony and slate 0 4; Mother coal 0 0½; Coal 0 1½	3	5	250	4
Bony and slate	0	2	250	6
Sandstone and slate bands	0	2	250	8
Sandstone	0	7	251	3
Slate	0	2	251	5
Sandstone	3	7	255	0

On the same western slope of Rich Mountain farther south three additional holes **(Nos. 4, 5, and 6 on Map II)** have been drilled by the West Virginia Coal and Coke Company on its own lands. These holes were located on the ground and their surface elevations secured but no one was able to furnish their numbers or the corresponding records, except that the Sewell Coal in No. 4 on the map was reported as being found at 429 feet with a thickness of 3′ 5″.

West of Roaring Creek in the same district two shallow holes **(Nos. 7 and 8 on Map II)** drilled in recent years by the West Virginia Coal and Coke Company on its own lands, were located on the ground but numbers and records were unobtainable. In the same territory the **George Phillips No. 1 (9), J. J. Phillips No. 2 (11),** and **John O'Connor No. 1 (12) Coal Test Borings** were drilled by the same company but the records were unobtainable. Also, the **J. J. Phillips No. 1 (10) Coal Test Boring,** which was drilled by the Davis Colliery Company or allied interests which preceded the West Virginia Coal and Coke Company, has never been obtained.

It should perhaps be stated that no apparent unwillingness to furnish any of these missing records in Roaring Creek District was encountered among officials of the West Virginia Coal and Coke Company but insurmountable difficulties caused by frequent changes of personnel and the moving of company records made it impossible to find them.

The following very interesting record shows a hole which was drilled along the western edge of the district:

P. J. Cain No. 1 (13) Coal Test Boring.

Roaring Creek District; on Middle Fork River, at Midvale; authority, P. J. Cain; elevation, 1849' L.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface	25	6	25	6
Sandstone	1	0	26	6
Coal, Campbell Creek?	1	5	27	11
Fire clay	1	0	28	11
Slate	9	7	38	6
Coal and bone, Powellton	0	10	39	4
Shale, light	4	0	43	4
Shale, dark	8	8	52	0
Slate, black	18	0	70	0
Coal and bone, Eagle	0	3	70	3
Shale, dark	5	0	75	3
Sand shale	16	9	92	0
Fire clay	2	0	94	0
Sand shale	11	0	105	0
Sandstone	1	0	106	0
Sand shale	33	0	139	0
Slate, black	0	10	139	10
Coal, Gilbert	0	5	140	3
Fire clay	3	5	143	8
Sand shale, **Upper Nuttall**	17	4	161	0
Conglomerate	11	1	172	1
Sandstone, hard, **Lower Nuttall**	23	4	195	5
Shale, sandy	2	6	197	11
Coal, Hughes Ferry	0	4	198	3
Shale, dark	16	0	214	3
Shale, light	2	9	217	0
Shale, dark	29	0	246	0
Sandstone, soft	3	0	249	0
Shale, light	8	0	257	0
Shale, dark	20	0	277	0
Shale, light	15	0	292	0
Sandstone, soft	4	0	296	0
Shale, dark	22	2	318	2
Sandstone, soft	5	3	323	5
Slate, black	1	6	324	11
Coal, Sewell "B"	0	3	325	2
Fire clay	0	9	325	11
Shale, dark	14	6	340	5
Coal 0' 4" Binder 0 2 **Coal** 0 5 } **Sewell (Sharon)**	0	11	341	4
Sandstone, soft, base of Pottsville	16	0	357	4
Shale, light	10	0	367	4
Shale, dark	15	0	382	4
Shale, light	10	0	392	4
Sandstone, blue, hard	7	0	399	4
Shale, red	3	0	402	4
Shale, light	6	0	408	4

		Thickness. Ft.	In.	Total. Ft.	In.
Sandstone soft ----- 15' 0" Conglomerate ------ 3 4 Sandstone, hard ---- 1 3	Princeton	19	7	427	11
Shale, green		1	6	429	5
Shale, red		3	0	432	5
Sandstone, blue		1	0	433	5
Shale, red		39	0	472	5
Shale, blue, sandy		72	0	544	5
Shale, red, to bottom		19	0	563	5

The **George M. Steele No. 1 (14) Coal Test Boring,** located in Washington District, Upshur County, at the forks of Middle Fork River 0.7 mile southwest of Gale and adjacent to the Randolph line, starts about 300 feet below the Lower Kittanning Coal and possibly tested the Sewell horizon, but its record could not be secured.

DETAILED COAL TEST RECORDS, MIDDLE FORK DISTRICT.

In Middle Fork District 26 test holes have been drilled for coal and many of these records have been secured as published in the present Chapter or in Chapter V in connection with measured sections.

The record of the **Andrew Currence No. 11 (15) Coal Test Boring,** drilled by the Davis Colliery Company interests and located on Three Forks Run of Middle Fork River 0.8 mile southwest of Cassity, has been used in connection with the Cassity Section, pages 133-4.

The three following records are from holes drilled on the waters of Cassity Fork, some of the cores having been inspected by the writer:

Cassity Fork Boom & Lumber Company No. 1 (16) Coal Test Boring.

Middle Fork District; on Josh Fork of Cassity Fork of Middle Fork River, 2.8 miles northeast of Cassity; authority, Alan Wood Iron & Steel Company; elevation, 2520' B.; completed, November 25, 1917.

		Thickness. Ft.	In.	Total. Ft.	In.
Sand and boulders		3	0	3	0
Fire clay		2	0	5	0
Sandstone, hard -------- 45' Sandstone, broken ------ 21 Shale, sandy -- ------- 14 Sandstone -------------- 33	Upper Conoquenessing	113	0	118	0
Shale, dark, **Quakertown**		4	0	122	0

	Thickness. Ft.	In.	Total. Ft.	In.
Sandstone 36′, Shale, gray 14, Sandstone 54 } Lower Connoquenessing	104	0	226	0
Shale, gray	2	0	228	0
Sandstone	7	0	235	0
Shale, dark	4	1	239	1
Coal, Chilton	0	11	240	0
Shale, gray	50	0	290	0
Sandstone, shaly	32	0	322	0
Shale, sandy	7	0	329	0
Shale, dark	21	6	350	6
Shale, black	0	10	351	4
Coal, Campbell Creek (Peerless)	2	4	353	8
Shale, dark	21	4	375	0
Sandstone, shaly	21	0	396	0
Shale, dark	1	0	397	0
Sandstone	18	0	415	0
Shale, sandy	6	0	421	0
Shale, dark	25	6	446	6
Slate, black	0	4	446	10
Coal 0′ 9″, Shale, gray 0 3, **Coal** 0 5 } **Eagle**	1	5	448	3
Fire clay	3	4	451	7
Shale, dark	0	10	452	5
Fire clay	2	6	454	11
Shale, sandy	5	1	460	0
Shale, dark, **Eagle**	27	0	487	0
Coal, Gilbert	0	6	487	6
Fire clay	3	6	491	0
Shale, dark	13	0	504	0
Shale, sandy	4	0	508	0
Sandstone, **Nuttall**	40	0	548	0
Shale, dark	13	0	561	0
Shale, sandy	1	0	562	0
Sandstone, **Harvey**	21	0	583	0
Shale, sandy	8	0	591	0
Shale, dark	3	6	594	6
Sandstone, **Guyandot**	20	6	615	0
Shale, dark	30	0	645	0
Shale, sandy	16	0	661	0
Sandstone	3	3	664	3
Coal, Sewell (Sharon)	0	3	664	6
Shale, dark, with coal partings	1	6	666	0
Sandstone, **Welch**	37	0	703	0
Shale, dark, Welch Coal horizon	1	0	704	0
Sandstone	4	0	708	0
Shale, sandy	15	0	723	0
Shale, dark, broken	13	0	736	0
Fire clay	3	0	739	0
Sandstone, hard 33′, Sandstone with large quartz pebbles 11 } **Upper Raleigh (Sharon)**	44	0	783	0

PLATE XLIII.—Old quarry of Standard Lime and Stone Company on Shavers Fork of Cheat one-third mile southeast of Bowden. Entire face is in the Union Limestone of Greenbrier Series, with 30 feet of shaly and sandy material at the top representing Bethel Sandstone stage, followed below by 55 feet of hard limestone representing Fredonia portion.
(Photo. by E. E. Harris.)

PLATE XLIV.—View in Western Maryland Railway cut along Shavers Fork one-half mile southeast of Bowden, showing typical cross-bedded structure of Fredonia portion of Union Limestone of Greenbrier Series.

(Photo. by E. E. Harris.)

PLATE XLV.—View at eastern base of Spruce Knob 3.8 miles southwest of Alpena, showing Union Limestone of Greenbrier Series. Upper ledge is probably Gasper portion but middle and lower ledges are Fredonia, with a small sinkhole at the base where the limestone rests on a Pocono Sandstone. (Photo. by E. E. Harris.)

PLATE XLVI.—View looking down Dry Fork of Cheat River at mouth of Laurel Fork at Jenningston, Tucker County. Heavy cliff and adjacent ridges are Catskill. (Photo. by U. S. Forest Service.)

Cassity Fork Boom & Lumber Company No. 2 (17) Coal Test Boring.

Middle Fork District; on Josh Fork of Cassity Fork, 1.6 miles northeast of Cassity; authority, Alan Wood Iron & Steel Company; elevation, 2145' B.; completed in December, 1917.

	Thickness. Ft.	In.	Total. Ft.	In.
Boulders and sand	13	0	13	0
Shale, sandy	1	6	14	6
Coal, Campbell Creek (Peerless)	3	3	17	9
Fire clay	3	3	21	0
Shale, sandy	5	0	26	0
Shale, dark	5	0	31	0
Coal, Powellton	2	0	33	0
Fire clay	5	0	38	0
Shale, dark	2	0	40	0
Fire clay	5	0	45	0
Shale, sandy	39	0	84	0
Sandstone	16	0	100	0
Shale, dark	35	0	135	0
Sandstone, shaly, broken	9	6	144	6
Coal, Eagle	1	6	146	0
Fire clay	4	0	150	0
Shale, sandy	27	0	177	0
Sandstone, shaly	13	0	190	0
Coal, Gilbert	1	4	191	4
Fire clay	1	8	193	0
Shale, sandy	17	0	210	0
Fire clay	2	0	212	0
Shale, dark, with coal partings	4	0	216	0
Sandstone, Nuttall	29	0	245	0
Shale, dark	13	0	258	0
Shale, sandy	10	3	268	3
Coal, Castle	0	5	268	8
Shale, dark, sandy	11	4	280	0
Shale, sandy	10	0	290	0
Shale, dark	46	0	336	0
Shale, dark, sticky	2	0	338	0
Coal, Sewell (Sharon)	1	0	339	0
Shale, dark	13	0	352	0
Coal, Welch	0	5	352	5
Slate	0	6	352	11
Fire clay	2	0	354	11
Shale, sandy	2	0	356	11
Sandstone, Upper Raleigh (Sharon), hard, pebbly	14	1	371	0

Cassity Fork Boom & Lumber Company No. 3 (18) Coal Test Boring.

Middle Fork District; on Panther Fork of Cassity Fork, 4 miles southwest of Cassity; authority, Alan Wood Iron and Steel Company; elevation, 2765' B.; completed in January, 1918.

	Thickness. Ft.	In.	Total. Ft.	In.
Sand, gravel and boulders	19	0	19	0

		Thickness. Ft.	In.	Total. Ft.	In.
Sand and gravel		7	5	26	5
Sandstone	Brownstown	75	7	102	0
Conglomerate	Brownstown	2	0	104	0
Fire clay		1	0	105	0
Sandstone		4	0	109	0
Conglomerate		1	0	110	0
Sandy shale		19	0	129	0
Fire clay		2	0	131	0
Sandy shale		24	0	155	0
Dark shale		2	0	157	0
Sandy shale		9	0	166	0
Fire clay		2	0	168	0
Sandy shale		33	0	201	0
Dark shale		8	4	209	4
Coal, Eagle		1	8	211	0
Fire clay		4	0	215	0
Dark shale		2	0	217	0
Sandy shale		8	0	225	0
Dark shale with sandy partings		8	0	233	0
Dark shale		40	7	273	7
Coal 0′ 11″; Sandy fire clay 1 6; Shale 1 4; **Coal** 1 0	**Gilbert**	4	9	278	4
Shale		15	8	294	0
Dark shale		1	0	295	0
Coal, Hughes Ferry		1	0	296	0
Fire clay		2	0	298	0
Dark shale with **coal** partings		2	0	300	0
Dark shale		5	0	305	0
Sandstone		14	0	319	0
Hard broken sandstone		15	0	334	0
Hard dark slate and shale		21	0	355	0
Dyke rock (?) 8′; Sandstone 20	**Lower Nuttall**	28	0	383	0
Broken, dark shale		48	0	431	0
Sandy shale, with **coal** partings at base, **Sewell "B"**		18	0	449	0
Hard broken shale		2	0	451	0
Gray shale		21	0	472	0
Sandstone		7	8	479	8
Coal, Sewell (Sharon)		1	8	481	4
Fire clay		0	6	481	10
Gray shale		8	2	490	0
Sandy shale		4	0	494	0
Sandstone		5	0	499	0
Sandy shale		5	0	504	0
Gray shale		7	8	511	8
Dark shale, **coal** partings, **Welch**		1	4	513	0
Dark shale		2	0	515	0
Hard sandstone 16′ 0″; Conglomerate sandstone 16 0; Sandstone 9 6; Sandy shale 9 6; Sandstone 25 0	**Upper Raleigh (Sharon)**	76	0	591	0

The following record is that of a hole located farther south along the Belington Syncline:

Womelsdorff Heirs No. 12 (19) Coal Test Boring.

Middle Fork District; on Stonecoal Run, 2.5 miles southward from Cassity; authority, Davis Colliery Company; (now W. Va. Coal & Coke Company; elevation, 2170' B.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface, boulders, and sand	11	0	11	0
Sandstone, gray, streaks of slate	10	1	21	1
Sandstone, gray	6	3	27	4
Slate, spotted with gray sandstone	5	3	32	7
Fire clay	4	0	36	7
Slate and fire clay	13	3	49	10
Bone coal	0	2	50	0
Fire clay, very soft	6	3	56	3
Slate and sandstone, mixed	9	5	65	8
Coal, Hughes Ferry	0	3	65	11
Sandstone and streaks of fire clay	9	0	74	11
Fire clay, slaty, little streaks of gray sandstone	38	6	113	5
Slate	37	2	150	7
Coal, slate mixed, **Castle**	2	4	152	11
Fire clay and slate, mixed, very soft	6	1	159	0
Sandstone and fire clay, mixed	25	2	184	2
Sandstone, gray	5	0	189	2
Fire clay, very soft	2	0	191	2
Coal, Sewell (Sharon), very good	4	1½	195	3½
Fire clay and slate	20	1½	215	5
Sandstone and fire clay	4	2	219	7
Sandstone, gray	18	2	237	9
Fire clay, spongy, very hard to drill	3	8	241	5
Sandstone, gray, very hard	2	7	244	0
Sandstone, gray, and lime, mixed	1	8½	245	8½
Sandstone, gray	9	3	254	11½
Fire clay and sandstone, mixed	1	11	256	10½
Sandstone, gray, trace of **coal** at bottom	5	0	261	10½
Slate, sandy, full of seams, broken up	6	2½	268	1
Sandstone, gray ---22' 7"; Sandstone, gray, and pea conglomerate ---42 0 } **Upper Raleigh (Sharon)**	64	7	332	8
Fire clay, sandy and spongy, very hard to drill	7	0	339	8
Fire clay, broken up and would not make core	3	1	342	9
Sandstone, gray, with pea conglomerate, very hard	18	10	361	7
Sandstone, conglomerate, mixed, hard	15	11	377	6
Sandstone, very hard	9	8	387	2
Sandstone and fire clay, mixed, to red beds	5	6	392	8

The record of the **John Fincham No. 14 (20) Coal Test Boring**, located at the mouth of Laurel Branch of Middle Fork

1.7 miles northward from Adolph, is published on pages 136-7, in connection with the section for Laurel Branch of Middle Fork.

The record of the **K. E. Zickefoose No. 13 (21) Coal Test Boring**, located at Adolph on Middle Fork River, is published in connection with the Adolph Section, pages 138-9.

The two following holes are located on the waters of Left Fork of Buckhannon River near the Upshur County line:

Elkhorn Coal Corporation No. 1 (22) Coal Test Boring.

Middle Fork District; on Lick Run of Left Fork of Buckhannon River, 0.6 mile south of Palace Valley; authority, Elkhorn Coal Corporation; elevation, 2340′ B.

				Thickness. Ft.	In.	Total. Ft.	In.
Surface				30	0	30	0
Shale				2	0	32	0
Slate				0	9	32	9
Coal smut				0	3	33	0
Fire clay				3	0	36	0
Shale				14	0	50	0
Slate				0	2	50	2
Coal, Sewell "B"				0	10	51	0
Fire clay				5	3	56	3
Slate and **coal**				1	0	57	3
Shale				4	2	61	5
Slate and **coal**				0	10	62	3
Soapstone				3	9	66	0
Shale				1	8	67	8
Slate				1	1	68	9
Fire clay				6	0	74	9
Slate				0	6	75	3
Coal	0′	4″	**Sewell (Sharon)**				
Shale	6	1					
Coal	0	2		6	7	81	10
Shale				21	8	103	6
Sandstone	72′	11″	**Upper Raleigh (Sharon)**				
Conglomerate	38	0		110	11	214	5
Fire clay				1	0	215	5
Conglomerate				1	7	217	0
Sandstone				5	0	222	0
Shale				21	6	243	6
Sandstone	23′	0″	**Princeton**				
Shale	5	6					
Sandstone	17	0					
Shale and sulphur balls	10	5		88	11	332	5
Sandstone and sulphur balls	10	0					
Sandstone	23	0					
Shale				1	0	333	5
Shale, red				36	9	370	2

	Thickness. Ft.	In.	Total. Ft.	In.
Shale, gray	2	2	372	4
Shale, red	1	0	373	4
Shale, gray	2	2	375	6
Sandstone	10	0	385	6

Elkhorn Coal Corporation No. 2 (23) Coal Test Boring.

Middle Fork District; on Lower Dry Run of Left Fork of Buckhannon River, 2.4 miles southeast of Palace Valley; authority, Elkhorn Coal Corporation; elevation, 2865′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface	19	0	19	0
Slate	23	6	42	6
Shale	2	8	45	2
Slate	8	1	53	3
Hughes Ferry: Slate and coal 0′ 10″; Coal and slate streaks 1′ 5″; Slate 1′ 2½″; Coal 1′ 0½″	4	6	57	9
Fire clay	5	6	63	3
Shale	15	7	78	10
Sandstone, Middle Iaeger	29	6	108	4
Slate	14	0	122	4
Fire clay	0	5	122	9
Coal, Lower Iaeger	0	3	123	0
Fire clay	5	6	128	6
Slate	2	5	130	11
Shale	2	4	133	3
Sandstone	1	0	134	3
Soapstone	6	0	140	3
Shale	8	0	148	3
Slate	7	4	155	7
Shale	6	11	162	6
Slate	3	0	165	6
Coal, Sewell "B"	0	3	165	9
Fire clay	10	6	176	3
Sandstone, Lower Guyandot	17	3	193	6
Slate	3	0	196	6
Sewell (Sharon): Coal 1′ 8″; Fire clay 3′ 0″; Slate 2′ 9″; Coal 0′ 6″	7	11	204	5
Fire clay	2	4	206	9
Shale	4	0	210	9
Slate	6	7	217	4
Sandstone, Upper Raleigh (Sharon)	103	4	320	8
Shale	2	10	323	6
Sandstone	4	8	328	2
Slate	7	3	335	5
Slate and coal, Fire Creek	3	7	339	0
Sandstone	11	0	350	0

The record of the **Alexander Boom and Lumber Company No. 1 (24) Coal Test Boring**, drilled by the same company and located on Dry Run of Left Fork of Buckhannon River 1.2 miles east of Star, was not obtained.

The record of the **Elkhorn Coal Corporation No. 1 (25) Coal Test Boring**, located on Beech Mountain 0.4 mile southeast of Hartridge, is published in connection with the Hartridge Section, pages 140-1.

The eight following records are those of holes bored on the lands of Elkhorn Coal Corporation on the waters of Left Fork of Buckhannon River:

Elkhorn Coal Corporation No. 2 (26) Coal Test Boring.

Middle Fork District; on Left Fork of Buckhannon River, 0.3 mile southeast of Hartridge; authority, Elkhorn Coal Corporation; completed, April 30, 1909; elevation, 3175' B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Surface	6	0	6	0
Shale	3	0	9	0
Sandstone	24	6	33	6
Shale	2	6	36	0
Sandstone	3	0	39	0
Shale	24	0	63	0
Bone	0	2	63	2
Coal, Eagle (?)	0	6	63	8
Shale	25	4	89	0
Sandstone, Lower Gilbert	32	0	121	0
Shale	2	0	123	0
Coal, Gilbert	0	8	123	8
Shale	70	4	194	0
Coal, Hughes Ferry	1	4	195	4
Shale	38	0	233	4
Coal, Lower Iaeger	1	1	234	5
Shale	28	7	263	0
Sandstone	2	0	265	0
Shale	26	0	291	0
Sandstone	19	0	310	0
Shale	17	0	327	0
Sandstone, Guyandot	10	0	337	0
Shale	2	0	339	0
Coal, Sewell "B"	0	3	339	3
Shale	27	9	367	0
Coal, Sewell (Sharon)	3	1	370	1
Shale	3	11	374	0

Elkhorn Coal Corporation No. 3 (27) Coal Test Boring.

Middle Fork District; on Beech Mountain, 0.8 mile southwest of Beech Run; authority, Elkhorn Coal Corporation; completed, August 2, 1909; elevation, 3350' B.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Gravel and boulders	18	0	18	0
Sandstone	67	0	85	0
Shale	9	0	94	0
Sandstone	9	0	103	0

	Thickness. Ft.	In.	Total. Ft.	In.
Sand shale	50	0	153	0
Sandstone, Eagle (?)	55	0	208	0
Sand and shale	148	0	356	0
Shale	58	0	414	0
Coal, Hughes Ferry	0	6	414	6
Shale	44	6	459	0
Coal, Lower Iaeger	0	3	459	3
Shale	41	0	500	3
Sandstone	58	9	559	0
Slate	3	0	562	0
Coal, Sewell "B"	0	5	562	5
Shale	15	7	578	0
Sandstone, Lower Guyandot	7	0	585	0
Shale, Hartridge	2	0	587	0
Coal, Sewell (Sharon)	1	11	588	11
Fire clay	8	1	597	0
Slate	0	5	597	5
Sandstone, Upper Raleigh (Sharon)	15	0	612	5
Shale	1	7	614	0
Red shale	3	0	617	0
Gray shale	5	0	622	0
Gray and green shale	34	0	656	0
Sandstone	21	0	677	0

Elkhorn Coal Corporation No. 4 (28) Coal Test Boring.

Middle Fork District; on Beech Run, 1.2 miles northeast of Hartridge; authority, Elkhorn Coal Corporation; completed, August 28, 1909; elevation, 2945' B.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface	21	0	21	0
Coal, Hughes Ferry	1	1	22	1
Shale	17	11	40	0
Coal, Lower Iaeger	0	3	40	3
Shale	25	0	65	3
Coal, Castle	0	3	65	6
Shale	65	0	130	6
Sandstone	2	6	133	0
Shale	1	0	134	0
Bone coal	0	3	134	3
Slate	2	0	136	3
Sandstone, Guyandot	17	6	153	9
Slate	0	6	154	3
Coal	0	10	155	1
Shale	8	0	163	1
Coal, Sewell "B"	1	0	164	1
Fire clay	4	4	168	5
Shale	3	4	171	9
Sandstone 6' 2"; Sand shale 3 0; Sandstone 4 0 — Lower Guyandot	13	2	184	11
Shale, Hartridge	6	1	191	0

			Thickness. Ft.	In.	Total. Ft.	In.
Coal 3′ 5″	Slate 0 2	Coal 0 1 — Sewell (Sharon)	3	8	194	8
Shale			10	4	205	0

Elkhorn Coal Corporation No. 5 (29) Coal Test Boring.

Middle Fork District; on Beech Run, 1.6 miles south of Beech Run village; authority, Elkhorn Coal Corporation; completed, September 9, 1909; elevation, 2945′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface	23	0	23	0
Coal, Hughes Ferry	2	0	25	0
Shale	42	0	67	0
Coal, Lower Iaeger	1	3	68	3
Fire clay	3	0	71	3
Shale	12	9	84	0
Sandstone	3	0	87	0
Shale	10	0	97	0
Coal, Castle	0	3	97	3
Shale	27	9	125	0
Sandstone, Guyandot	40	0	165	0
Shale	10	0	175	0
Coal	0	4	175	4
Slate	0	5	175	9
Coal	0	2	175	11
Shale	8	8	184	7
Coal, Sewell "B"	1	2	185	9
Slate	0	4	186	1
Shale	15	11	202	0
Coal, Sewell (Sharon)	2	2	204	2
Shale	35	10	240	0
Sandstone, Upper Raleigh (Sharon)	3	0	243	0
Shale	21	0	264	0
Red and green shale	12	0	276	0
Sandstone — Princeton	28	0	304	0
Conglomerate — Princeton	4	0	308	0

Elkhorn Coal Corporation No. 6 (30) Coal Test Boring.

Middle Fork District; on Left Fork of Buckhannon River, 1.1 miles northeast of Hartridge; authority, Elkhorn Coal Corporation; completed, September 24, 1909.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface	24	0	24	0
Shale	12	0	36	0
Sandstone	2	0	38	0
Shale	85	0	123	0
Sandstone	2	0	125	0
Shale	1	0	126	0
Sandstone	3	0	129	0
Conglomerate	7	0	136	0

Elkhorn Coal Corporation No. 7 (31) Coal Test Boring.

Middle Fork District; on Beech Run, 1.8 miles south of Beech Run village; authority, Elkhorn Coal Corporation; elevation, 2870' B.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface	6	0	6	0
Sandstone, Guyandot	50	0	56	0
Shale	4	0	60	0
Coal, Sewell "B"	1	0	61	0
Fire clay	5	0	66	0
Sandstone, Lower Guyandot	15	0	81	0
Shale, Hartridge	5	0	86	0
Coal, Sewell (Sharon)	2	8	88	8
Fire clay	1	4	90	0

Elkhorn Coal Corporation No. 8 (32) Coal Test Boring.

Middle Fork Distrirt; on Beech Run, 2.1 miles south of Beech Run village; authority, Elkhorn Coal Corporation; completed, November 9, 1909; elevation, 2935' B.

	Thickness. Ft.	In.	Total. Ft.	In.
Boulders and gravel	30	0	30	0
Sandstone	1	0	31	0
Shale	21	0	52	0
Sandstone	15	0	67	0
Shale	33	0	100	0
Sandstone	40	0	140	0
Shale	1	0	141	0
Sandstone	12	0	153	0
Shale	3	0	156	0
Sandstone, Guyandot	18	0	174	0
Shale	9	0	183	0
Coal, Sewell "B"	0	6	183	6
Shale, Hartridge	17	6	201	0
Coal, Sewell (Sharon)	3	0	204	0
Shale	13	0	217	0

Elkhorn Coal Corporation No. 9 (33) Coal Test Boring.

Middle Fork District; on the waters of Beech Run, 0.4 mile south of Beech Run village; authority, Elkhorn Coal Corporation; elevation, 3055' B.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface	10	0	10	0
Shale	15	0	25	0
Shale and sandstone partings	131	0	156	0
Shale	106	6	262	6
Coal, Castle	0	4	262	10
Shale	28	2	291	0
Sandstone	2	0	293	0
Shale	35	0	328	0
Sandstone, Guyandot	26	0	354	0
Shale	5	0	359	0
Bone	0	1	359	1

	Thickness. Ft.	In.	Total. Ft.	In.
Coal, Sewell "B"	0	7	359	8
Shale	1	0	360	8
Sandstone	1	6	362	2
Shale	1	0	363	2
Sandstone	0	3	363	5
Shale	0	2	363	7
Coal, Sewell (Sharon)	2	6	366	1
Shale	8	11	375	0

The following record was furnished the Survey by U. L. Brennan, of Green Grove, Pennsylvania, and is that of a hole bored on land now the property of the Buckhannon Chemical Company:

Buckhannon Chemical Co. No. 1 (34) Coal Test Boring.

Middle Fork District; at the forks of Buckhannon River just south of Newlonton; authority, Buckhannon Chemical Company; completed in 1891; elevation, 1905′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Sandstone	26	5	26	5
Slate, brown	3	0	29	5
Slate, very black	69	7	99	0
Sandstone	46	0	145	0
Slate rock and sandstone	74	0	219	0
Sandstone	50	4	269	4
Slate rock	30	10	300	2
Sandstone	19	10	320	0

The following is the record of a churn drill hole furnished the Survey by J. A. McCauley, of Silica:

J. A. McCauley No. 1 (35) Coal Test Boring.

Middle Fork District; on Buckhannon River, at Silica; authority Cutright Brothers; elevation, 2335′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Unrecorded	8	0	8	0
Sandstone	4	0	12	0
Coal, Eagle	4	0	16	0

According to Dr. J. L. Cunningham, of Pickens, the **Holly Lumber Company Water Well (36)**, drilled on its property at the Pickens mill, found four feet of coal at a depth of 56 feet, which would correlate with the Eagle seam.

The **Thomas No. 1 (37), Pickens No. 2 (38), Shock No. 3 (39)**, and **Winkler No. 4 (40) Coal Test Borings**, all made by the Bethlehem Steel Company in the neighborhood of Pickens, as shown on Map II, were deep tests through all the coals. In the Summarized Record of Tests for Coal the depths to the various coals are recorded but the company stated through Mr. D. D. Teets, Jr., who was its Assistant Geologist when the tests were made, that the landowners refused permission to publish the thicknesses of the coals and they are therefore omitted from the table.

DETAILED COAL TEST RECORDS, NEW INTEREST DISTRICT.

In New Interest District only a slight fringe of the coal rocks exist along the summit of Laurel Ridge but in spite of this fact the **Joseph Phenecie No. 1 (41) Coal Test Boring** was made by unknown parties on land now owned by Isobel Ross on Saltlick Run just above its junction with Leading Creek 0.8 mile southward from Montrose. This hole starts about the middle of the Portage Series where no hope could exist for finding coal at any greater depth. No record of this hole, which was completed about 1905, or thereabouts, could be obtained.

DETAILED COAL TEST RECORDS, LEADSVILLE DISTRICT.

In Leadsville District eight coal test wells have been drilled, all of which start below the Lower Kittanning Coal and are therefore tests of the Pottsville measures. The record of the **Davis Coal and Coke Company No. 1 (42) Coal Test Boring,** located on Beaver Creek at Weaver was not obtained. The two following records are those of holes drilled on the western slope of Laurel Ridge:

Susan Darby No. 1 (43) Coal Test Boring.

Leadsville District; on a branch of Beaver Creek, 1.1 miles east of Weaver; authority, Davis Coal & Coke Co.; elevation, 2365′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Coal?, Quakertown	4	0	4	0
Soil	6	0	10	0
Shale	34	0	44	0
Slate	5	0	49	0
Sandstone, Lower Connoquenessing, gray	18	0	67	0
Slate	5	0	72	0
Sandstone, gray	1	0	73	0
Slate and sandstone, mixed	18	0	91	0
Sandstone, gray	4	0	95	0
Slate and sandstone, mixed	8	0	103	0
Lower Cedar Grove (?): Sandstone, blue, very hard 5′ 0″; Sandstone, blue, broken, very hard 24 0; Sandstone, gray 0 9	29	9	132	9
Slate	18	0	150	9
Slate, black	0	11	151	8

	Thickness. Ft.	In.	Total. Ft.	In.
Slate, very soft	3	0	154	8
Clay	3	0	157	8
Coal, Campbell Creek (?)	3	7	161	3
Slate	7	5	168	8
Coal, Powellton (?)	0	6	169	2
Slate	6	0	175	2
Sandstone, gray	35	6	210	8
Slate, mixed with sandstone	5	0	215	8
Slate	12	0	227	8
Sandstone, blue, very hard	31	0	258	8
Slate	1	6	260	2
Slate, black	6	0	266	2
Coal, Eagle	6	0	272	2
Slate, black	6	0	278	2
Slate, gray	0	6	278	8
Slate and sandstone, mixed	31	0	309	8
Sandstone, blue, very hard	21	0	330	8
Slate	1	9	332	5
Slate and sandstone, mixed	16	0	348	5
Sandstone, blue, very hard	21	0	369	5
Sandstone and slate, mixed	4	0	373	5
Sandstone, gray 48'; Sandstone and slate, mixed 24 — Lower Guyandot	72	0	445	5
Coal, Sewell (Sharon)	2	0	447	5

According to Teets, the above boring starts on the outcrop of the Upper Connoquenessing Sandstone, hence the presence of a four-foot seam of coal at the top seems improbable. The record of this hole, as secured by the Survey, had not been well kept and it is possible that the portion of the sandstone overlying this coal may have been omitted.

Susan Darby No. 2 (44) Coal Test Boring.

Leadsville District; on a branch of Beaver Creek, 1.1 miles southeast of Weaver; authority, Davis Coal & Coke Co.; elevation, 2430' B.

	Thickness. Ft.	In.	Total. Ft.	In.
Soil	16	0	16	0
Slate	2	0	18	0
Slate and little coal, Quakertown	1	0	19	0
Slate	7	0	26	0
Sandstone 4'; Sandstone, blue, very hard, and broken 11; Sandstone, gray 11 — **Lower Connoquenessing**	26	0	52	0
Coal, Alma (?)	0	5	52	5
Slate	3	0	55	5
Sandstone, gray 5' 6"; Sandstone, blue, very hard and broken 29 0 — **Monitor (?)**	34	6	89	11

	Thickness. Ft.	In.	Total. Ft.	In.
Flint, very coarse and pebbly	8	0	97	11
Flint, coarse-grained	3	0	100	11
Flint	9	0	109	11
Sandstone, very hard and flinty	21	0	130	11
Flint	3	0	133	11
Slate	13	0	146	11
Sandstone, gray	2	0	148	11
Slate and sandstone, mixed	19	0	167	11
Sandstone, gray	32	0	199	11
Slate, black	5	0	204	11
Sandstone, gray	8	6	213	5
Slate and sandstone, mixed	63	0	276	5
Slate, black	2	4	278	9
Slate and sandstone, mixed	17	8	296	5
Sandstone, gray	70	0	366	5
Slate, black, and sandstone, mixed	7	0	373	5

The record of the **Coberly No. 1 (45) Coal Test Boring,** located along Tygart River 0.9 mile southwest of Gage, is published in connection with the Gage Section, pages 146-7. The records of the **West Virginia Coal and Coke Company (formerly Davis Colliery Company) No. 1 (46) Coal Test Boring, and the No. 2 (47)** of the same interests, both located at Harding, were not secured.

The record of the **William Corley No. 9 (48) Coal Test Boring,** located on the northeast side of Tygart River at Norton Station, has been published in connection with the Norton Section, pages 129-30.

The following is the record of a churn drill hole, located in the gap of Tygart River, as furnished the Survey by P. B. Bloomfield, of Elkins, General Manager of the company that made it:

Elkins Electric Railway Co. No. 1 (49) Coal Test Boring.

Leadsville District; on the Tygart River, 1.8 miles east of Norton (Roaring Creek Junction); authority, Elkins Electric Railway; elevation, 2060' B.

	Thickness. Ft.	In.	Total. Ft.	In.
Dirt and small stone	30	0	30	0
Sandstone, hard	9	0	39	0
Coal, Welch (1' 6"), and fire clay	3	0	42	0
Sandstone, shaly	108	0	150	0

DETAILED COAL TEST RECORDS, HUTTONSVILLE DISTRICT.

In Beverly and Valley Bend Districts no tests for coal have been bored. In Huttonsville District, which embraces portions of both the Shavers Fork and Rich Mountain areas, there have been 17 holes of which 16 were bored by the West Virginia Pulp and Paper Company on its own land in the valley of Shavers Fork. Of these holes **Nos. 1A (50), 2 (51), 3 (52), 4 (53), 5 (54),** and **6 (55)** were completed many years ago but the remainder were made in 1917 under the supervision of the writer who inspected the cores. The record of **No. 6 (55)** was lost before the second drilling enterprise was begun but through Mr. Charles W. Luke of the company, all the others have been made available to the public, being as follows:

W. Va. Pulp & Paper Co. No. 1A (50) Coal Test Boring.

Huttonsville District; on spur of Cheat Mountain south of Lambert Run 3 miles southwest of Cheat Bridge; elevation, 4330′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (556′ 9)				
Clay	6	0	6	0
Sandstone, Brownstown	59	0	65	0
Coal, Eagle (4262′ B.)	2	6	67	6
Slate	9	0	76	6
Sandstone, Lower Gilbert	40	0	116	6
Slate	14	3	130	9
Coal, Gilbert (4197′ B.)	2	4	133	1
Fire clay	8	0	141	1
Sandstone, Dotson	23	0	164	1
Coal, Douglas (4165′ B.)	0	10	164	11
Fire clay	18	0	182	11
Sandstone, Upper and Lower Nuttall	110	0	292	11
Slate	10	0	302	11
Coal, Hughes Ferry (4025′ B.)	2	2	305	1
Fire clay	11	0	316	1
Sandstone	3	0	319	1
Coal, Lower Iaeger (4010′ B.)	0	10	319	11
Sandstone 16′ 0″; Slate 1 0; Sandstone 5 0 } **Harvey**	22	0	341	11
Slate	4	8	346	7
Coal, Castle (3983′ B.)	0	6	347	1
Fire clay	4	0	351	1
Sandstone, Guyandot	6	0	357	1
Slate	6	0	363	1
Coal, Sewell "B" (3966′ B.)	1	2	364	3
Slate	6	0	370	3
Coal, Sewell "A"	0	2	370	5
Sandstone 3′ 0″; Slate 6 0; Sandstone 4 0 } **Lower Guyandot**	13	0	383	5
Coal 2′ 6″; Slate 4 0; **Coal** 1 0 } **Sewell (Sharon)** (3939′ B.)	7	6	390	11
Slate	12	0	402	11

	Thickness. Ft.	In.	Total. Ft.	In.
Coal	0	7	403	6
Slate	3	0	406	6
Fire clay	4	0	410	6
Sandstone, Welch	4	0	414	6
Coal, Welch (3913' B.)	2	6	417	0
Slate	4	0	421	0
Sandstone 80' / Slate 7 / Sandstone 40 } Upper Raleigh (Sharon)	127	0	548	0
Slate	0	7	548	7
Coal, Fire Creek (3780' B.)	1	2	549	9
Fire clay, to bottom	7	0	556	9

W. Va. Pulp & Paper Co. No. 2 (51) Coal Test Boring.

Huttonsville District; on south side of Lambert Run 1.6 miles above mouth and 3 miles southwest of Cheat Bridge; elevation, 3920' B.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (126' 0")				
Clay	18	0	18	0
Sandstone, Upper Raleigh (Sharon) (3798' B.)	104	0	122	0
Slate	4	0	126	0
Mauch Chunk Series (183' 2")				
Shale, blue	8	0	134	0
Shale, red	42	0	176	0
Shale, blue	26	0	202	0
Sandstone, Princeton	14	0	216	0
Coal (3704' B.)	0	2	216	2
Slate	4	0	220	2
Shale, red	10	0	230	2
Shale, blue	11	0	241	2
Sandstone, Falls Mills?	43	0	284	2
Shale, blue, to bottom	25	0	309	2

W. Va. Pulp & Paper Co. No. 3 (52) Coal Test Boring.

Huttonsville District; on White Top Mountain 1 mile west of Cheat Bridge; elevation, 4268' L.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (272' 4")				
Sandstone	50	0	50	0
Slate	9	0	59	0
Coal, Campbell Creek (Peerless) (4207' L.)	1	6	60	6
Conglomerate stone 11' 0" / Slate 7 0 / Sandstone, blue 14 0 } Brownstown	32	0	92	6
Slate	36	0	128	6
Coal, Powellton (4139' L.)	0	8	129	2
Slate	28	0	157	2

	Thickness. Ft.	In.	Total. Ft.	In.
Sandstone, Eagle, conglomeratic in lower portion	42	0	199	2
Coal, Eagle, (4067′ L.)	2	2	201	4
Slate	4	0	205	4
Sandstone, Decota	8	0	213	4
Slate	3	0	216	4
Coal, Little Eagle	0	2	216	6
Slate	7	0	223	6
Sandstone, Grapevine?	8	0	231	6
Slate	7	0	238	6
Sandstone, Lower War Eagle	23	0	261	6
Slate	4	0	265	6
Coal 0′ 10″; Slate 5 0; Coal (to bottom of hole) 1 0 — Lower War Eagle (3996′ L.)	6	10	272	4

W. Va. Pulp & Paper Co. No. 4 (53) Coal Test Boring.

Huttonsville District; on White Top Mountain 0.8 mile west of Cheat Bridge; elevation, 4046′ L.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (258′ 6″)				
Clay and stone	14	0	14	0
Stone	8	0	22	0
Slate	48	0	70	0
Sandstone	32	0	102	0
Slate	4	0	106	0
Coal and a little slate, Gilbert (3937′ L)	3	0	109	0
Slate	16	0	125	0
Sandstone, Nuttall	50	0	175	0
Slate	8	0	183	0
Coal (3861′ L.)	2	0	185	0
Slate	18	0	203	0
Coal and slate, mixed, Hughes Ferry (3839′ L)	3	6	206	6
Slate	10	0	216	6
Sandstone, Harvey	42	0	258	6

W. Va. Pulp & Paper Co. No. 5 (54) Coal Test Boring.

Huttonsville District; on White Top Mountain just south of Staunton and Parkersburg Pike and 0.7 mile northwest of Cheat Bridge; elevation, 3953′ L.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (232′ 1″)				
Stone and slate	25	0	25	0
Slate	5	0	30	0
Coal, Gilbert (3920′ L.)	3	0	33	0
Slate	28	0	61	0
Sandstone, Nuttall	52	0	113	0
Slate	18	0	131	0

	Thickness. Ft.	In.	Total. Ft.	In.
Coal 1' 2"				
Slate 2 0				
Coal 2 1				
Slate 4 0				
Coal 0 5				
Hughes Ferry (3812' L.)	9	8	140	8
Slate	6	0	146	8
Sandstone, Harvey	38	0	184	8
Slate	2	0	186	8
Coal 0' 2"				
Slate 0 8				
Coal 1 0				
Castle (3764' L.)	1	10	188	6
Sandstone, Guyandot	6	0	194	6
Slate	4	0	198	6
Sandstone, Lower Guyandot	28	0	226	6
Coal, Sewell (Sharon) (3724' L.)	2	7	229	1
Slate, to bottom	3	0	232	1

W. Va. Pulp & Paper Co. No. 6 (55) Coal Test Boring.

Huttonsville District; on eastern slope of White Top Mountain north of Staunton and Parkersburg Pike and 0.3 mile northwest of Cheat Bridge; elevation, 3785' B.

Record lost.

W. Va. Pulp & Paper Co. No. 7 (56) Coal Test Boring.

Huttonsville District; near bridge of Staunton and Parkersburg Pike across Red Run 1.8 miles northwest of Cheat Bridge; elevation, 3655' B.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (81' 9")				
Surface	21	4	21	4
Shale and wash	3	8	25	0
Coal and bone, Sewell (Sharon) (3629' B.)	1	3	26	3
Fire clay and wash	6	0	32	3
Shale	1	0	33	3
Fire clay and wash	3	9	37	0
Sandstone, Upper Raleigh (Sharon), slaty at top	40	0	77	0
Fire clay	4	9	81	9
Mauch Chunk Series (20' 7")				
Shale, red	12	6	94	3
Shale, green	2	0	96	3
Shale, green and red	3	4	99	7
Shale, green, to bottom	2	9	102	4

W. Va. Pulp & Paper Co. No. 8 (57) Coal Test Boring.

Huttonsville District; on a spur of Cheat Mountain 0.6 mile southeast of Cromer Top and 2.5 miles northwest of Cheat Bridge; elevation, 4215' B.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (259' 0")				
Surface	2	0	2	0

	Thickness. Ft.	In.	Total. Ft.	In.
Shale and wash	8	0	10	0
Shale, sandy	4	0	14	0
Sandstone, partly conglomerate	33	2	47	2
Shale, dark, soft	3	11	51	1
Sandstone	0	9	51	10
Coal, Cedar Grove (4163' B.)	0	1	51	11
Sandstone	0	3	52	2
Shale, sandy	2	8	54	10
Fire clay	2	6	57	4
Shale, with sandy streaks	29	3	86	7
Coal	0	4	86	11
Fire clay	2	0	88	11
Sandstone, with shale streaks	33	2	122	1
Coal, Campbell Creek (Peerless) (4092' B.)	0	7	122	8
Fire clay	1	8	124	4
Shale, sandy	10	0	134	4
Shale, with sandstone streaks	7	9	142	1
Sandstone, broken	44	2	186	3
Coal, Eagle (4026' B.)	2	3	188	6
Fire clay	1	8	190	2
Shale, with streaks of sandstone	20	0	210	2
Shale, dark	2	7	212	9
Fire clay	2	10	215	7
Shale, dark	2	9	218	4
Shale, with sandstone streaks	21	4	239	8
Shale	0	5	240	1
Coal 2' 0"; **Coal**, laminated 0 6 } **Gilbert** (3972' B.)	2	6	242	7
Fire clay	1	0	243	7
Shale, dark, soft, broken, to bottom of hole	15	5	259	0

W. Va. Pulp & Paper Co. No. 8A (58) Coal Test Boring.

Huttonsville District; on a spur of Cheat Mountain 0.6 mile southeast of Cromer Top and 2.5 miles northwest of Cheat Bridge; elevation, 3982' B.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (367' 6")				
Surface	7	0	7	0
Sandstone, broken, wash	13	5	20	5
Shale, broken, sandstone streaks	6	7	27	0
Shale, sandy	18	4	45	4
Coal, laminated 0' 3"; Shale, dark 5 2; **Coal**, and bone 0 3; **Coal** 1 2; **Bone coal** 0 4 } **Douglas** (3929' B.)	7	2	52	6
Shale, with **coal** streaks	2	3	54	9
Shale, with sandstone streaks	1	9	56	6
Shale, sandy	6	6	63	0
Shale, dark, with **coal** streaks	15	2	78	2
Fire clay, shaly	3	4	81	6
Sandstone, Nuttall, with shale streaks	24	10	106	4

		Thickness. Ft.	In.	Total. Ft.	In.
Bone		0	1	106	5
Conglomerate rock		1	0	107	5
Shale, with sandy streaks		8	10	116	3
Coal, laminated ----0′ 3″	Hughes Ferry (3864′ B.)				
Coal ----1 4		1	7	117	10
Sandstone		0	3	118	1
Fire clay		1	6	119	7
Shale, sandy		10	2	129	9
Slate, dark		1	11	131	8
Coal ----1′ 4″	Lower Iaeger (3843′ B.)				
Bone ----0 1					
Fire clay ----3 0					
Dark shale ----1 10					
Coal ----1 1		7	4	139	0
Shale, dark		5	0	144	0
Sandstone, dark		1	0	145	0
Shale, with sandstone streaks		3	7	148	7
Coal Castle (3833′ B.)		0	10	149	5
Shale, with sandstone streaks		5	10	155	3
Sandstone		0	6	155	9
Shale, dark		1	5	157	2
Sandstone		2	11	160	1
Shale, sandy		15	3	175	4
Sandstone, Guyandot		37	6	212	10
Shale, sandy		2	3	215	1
Coal ----0′ 2″	Sewell "B" (3766′ B.)				
Coal, bony ----0 1					
Coal ----0 6		0	9	215	10
Sandstone, Lower Guyandot		8	2	224	0
Shale, Hartridge, sandy		3	9	227	9
Coal ----0′ 10″	Sewell (Sharon) (3750′ B.)				
Coal, bony ----1 0					
Slate, dark ----0 8					
Coal, very soft ----0 6					
Coal, very soft, core lost ----1 5		4	5	232	2
Fire clay		3	3	235	5
Sandstone, Welch		33	1	268	6
Shale, sandy		2	0	270	6
Shale, with coal streaks		1	4	271	10
Coal, bony ----0′ 3″	Welch (3709′ B.)				
Coal ----0 9		1	0	272	10
Shale, dark, with coal streaks		0	4	273	2
Slate, with coal streaks		4	4	277	6
Fire clay		2	11	280	5
Shale, dark, with coal streaks		5	0	285	5
Sandstone, Upper Raleigh (Sharon), with a few streaks of coal and shale		82	1	367	6
Mauch Chunk Series (16′ 6″)					
Shale, green		0	10	368	4
Sandstone, greenish		2	4	370	8
Shale, green		1	3	371	11
Sandstone, greenish		6	9	378	8

	Thickness. Ft.	In.	Total. Ft.	In.
Shale, green	1	0	379	8
Shale, red, to bottom	4	4	384	0

W. Va. Pulp & Paper Co. No. 8B (59) Coal Test Boring.

Huttonsville District; on a spur of Cheat Mountain 0.5 mile east of Cromer Top and 2.5 miles northwest of Cheat Bridge; elevation, 3826′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (112′ 9″)				
Surface	1	6	1	6
Shale and wash (very soft)	14	9	16	3
Fire clay	4	6	20	9
Coal, Lower Iaeger (3805′ B.)	0	6	21	3
Shale	3	9	25	0
Sandstone, Harvey, dark	2	0	27	0
Shale	2	0	29	0
Coal, Castle (3796′ B.)	0	6	29	6
Fire clay	3	10	33	4
Shale	6	0	39	4
Shale, streaked with sandstone	2	6	41	10
Shale, dark	1	0	42	10
Coal	0	6	43	4
Shale, sandy	8	11	52	3
Shale, dark	3	8	55	11
Coal	0	3	56	2
Shale, with streaks of sandstone	6	9	62	11
Sandstone	3	1	66	0
Slate	0	4	66	4
Coal (3759′ B.)	0	4	66	8
Shale, sandy	5	6	72	2
Sandstone, Guyandot	7	7	79	9
Coal, Sewell "B" (3745′ B.)	1	2	80	11
Shale, Hartridge, sandy	25	3	106	2
Coal 0′ 11″; **Coal,** bony 0 3; **Coal,** bony (core lost) 0 9; Slate, with **coal** streaks 0 5; **Coal,** very soft 0 10; **Coal,** very soft (core lost) 1 0; **Coal,** bony 0 4 — **Sewell (Sharon)** (3715′ B.)	4	6	110	8
Fire clay, to bottom	2	1	112	9

W. Va. Pulp & Paper Co. No. 9 (60) Coal Test Boring.

Huttonsville District; on north side of Crouch Run 1.2 miles above mouth and 1.2 miles southwest of Linan Mine; elevation, 3610′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (359′ 7″)				
Surface	40	0	40	0

	Thickness. Ft.	In.	Total. Ft.	In.
Shale, gray	44	0	84	0
Coal 1' 1"				
Slate 0 6				
Coal 2 0				
Bone and coal 0 2				
Fire clay 0 1				
Bone coal 0 2				
Douglas (3522' B.)	4	0	88	0
Fire clay	0	6	88	6
Shale, gray	20	3	108	9
Sandstone, Lower Nuttall, hard	24	8	133	5
Coal 0' 2"				
Sandstone 0 5				
Coal 0 2				
Hughes Ferry (3476' B.)	0	9	134	2
Fire clay	8	6	142	8
Shale, sandy	10	2	152	10
Sandstone	3	6	156	4
Coal, Lower Iaeger	0	2	156	6
Bone	0	7	157	1
Shale, hard, sandy	30	1	187	2
Fire clay	0	2	187	4
Coal, Castle (3422' B.)	1	1	188	5
Shale, dark	0	3	188	8
Shale, sandy	2	6	191	2
Slate, black	2	0	193	2
Fire clay	5	6	198	8
Shale, black	4	0	202	8
Shale, sandy	3	0	205	8
Sandstone, Guyandot	5	4	211	0
Slate	0	11	211	11
Bone	0	2	212	1
Coal (3397' B.)	0	6	212	7
Fire clay	1	2	213	9
Shale, sandy	19	10	233	7
Slate, black	1	0	234	7
Coal 0' 2"				
Fire clay 1 7				
Coal 0 2				
Sewell "B" (3373' B.)	1	11	236	6
Fire clay	3	0	239	6
Shale, Hartridge, sandy	23	5	262	11
Fire clay	0	4	263	3
Coal, bony cannel 1' 3"				
Coal, soft 0 5				
Sewell (3345' B.)	1	8	264	11
Fire clay	1	5	266	4
Shale, sandy	16	2	282	6
Shale, dark	5	0	287	6
Shale, sandy	3	0	290	6
Shale, dark	1	5	291	11
Coal and bone, Welch (3317' B.)	0	10	292	9
Fire clay	5	2	297	11
Shale, sandy	2	0	299	11

				Thickness. Ft.	In.	Total. Ft.	In.
Sandstone, white, pebbly	40′	9″					
Shale, sandy, coal spars at base	7	0					
Conglomerate	1	6					
Shale, sandy	1	0					
Sandstone, with conglomerate pebbles	2	10	Upper Raleigh (Sharon)	56	2	356	1
Shale, sandy	1	0					
Sandstone, with conglomerate pebbles	2	1					
Shale, hard, sandy				3	6	359	7
Mauch Chunk Series (153′ 1″)							
Shale, green				1	3	360	10
Shale, sandy				2	5	363	3
Sandstone, Princeton, hard, with conglomerate pebbles and a few streaks of shale				142	10	506	1
Shale, green				1	8	507	9
Shale, red, to bottom				4	11	512	8

W. Va. Pulp & Paper Co. No. 10 (61) Coal Test Boring.

Huttonsville District; on a spur of Cheat Mountain north of Crouch Run and 1.2 miles northwest of Linan Mine; elevation, 3940′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (422′ 0″)				
Surface	13	4	13	4
Slate	7	8	21	0
Coal, Chilton (3918′ B.)	1	0	22	0
Fire clay	5	0	27	0
Shale, sandy	38	0	65	0
Shale	29	7	94	7
Slate	27	8	122	3
Sandstone, Brownstown	13	5	135	8
Slate	85	6	221	2
Shale, dark, streaked with sandstone	24	0	245	2
Sandstone, Lower Gilbert, pebbly, with a few streaks of shale	71	10	317	0
Shale	1	2	318	2
Slate	4	0	322	2
Coal, Gilbert (3617′ B.)	1	3	323	5
Slate	5	11	329	4
Sandstone, crystallized	1	0	330	4
Slate	1	4	331	8
Sandstone	3	0	334	8
Slate	19	11	354	7
Sandstone	0	6	355	1
Coal (3585′ B.)	0	1	355	2
Slate	2	3	357	5
Shale	21	7	379	0

	Thickness. Ft.	In.	Total. Ft.	In.
Shale and sandstone, mixed	16	11	395	11
Sandstone	3	2	399	1
Coal, Douglas (3540′ B.)	1	1	400	2
Fire clay	1	9	401	11
Slate, with sandstone streaks	8	11	410	10
Slate	3	7	414	5
Shale	1	4	415	9
Slate	1	4	417	1
Slate, with **coal** streaks	0	3	417	4
Slate, to bottom	4	8	422	0

W. Va. Pulp & Paper Co. No. 11 (62) Coal Test Boring.

Huttonsville District; on north side of Stonecoal Run 1.7 miles above mouth and 3.4 miles northwest of Cheat Bridge; elevation, 3710′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (216′ 5″)				
Surface	27	0	27	0
Sandstone, Guyandot, shaly	9	6	36	6
Shale, sandy	16	0	52	6
Coal, bony, Sewell "B" (3657′ B.)	0	10	53	4
Fire clay	6	6	59	10
Shale, with sandstone streaks	20	5	80	3
Sandstone, Lower Guyandot	21	0	101	3
Shale, Hartridge	7	1	108	4
Coal, dirty 0′ 6″; **Coal** 1 3; **Bone** 0 2; **Coal** 0 10 — **Sewell** (3599′ B.)	2	9	111	1
Fire clay	5	6	116	7
Sandstone, Upper Raleigh (Sharon), conglomerate, with a few streaks of shale	99	10	216	5
Mauch Chunk Series (61′ 1″)				
Sandstone, greenish	4	0	220	5
Shale, greenish, with streaks of sandstone	6	10	227	3
Sandstone, greenish	11	11	239	2
Shale, with **coal** streaks	1	1	240	3
Shale, greenish	1	3	241	6
Coal, Pluto	0	4	241	10
Shale, greenish	0	9	242	7
Shale, dark	2	10	245	5
Shale, greenish	2	4	247	9
Shale, dark, with **coal** streaks	1	0	248	9
Shale, greenish	0	6	249	3
Sandstone, greenish	9	10	259	1
Sandstone, red cast	16	8	275	9
Shale, green	1	0	276	9
Shale, red, to bottom	0	9	277	6

W. Va. Pulp & Paper Co. No. 12 (63) Coal Test Boring.

Huttonsville District; on a spur of Cheat Mountain north of Stonecoal Run 0.5 mile northeast of Hole No. 11 and 3.5 miles northwest of Cheat Bridge; elevation, 3988′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (306′ 0″)				
Surface	9	0	9	0
Sandstone, Decota	97	3	106	3
Shale, with sandstone streaks	5	0	111	3
Shale, dark	4	9	116	0
Shale, sandy, with sandstone streaks	66	6	182	6
Shale, dark	2	9	185	3
Coal, Gilbert, very good (3800′ B.)	2	9	188	0
Fire clay	1	1	189	1
Shale, sandy	5	2	194	3
Shale, dark	14	8	208	11
Coal, Hughes Ferry, very good (3777′ B.)	2	1	211	0
Fire clay	1	0	212	0
Shale, sandy	1	6	213	6
Sandstone, Harvey, dark, pebbly at base	62	6	276	0
Coal 0′ 2″ / Bone 0 7 / **Coal,** laminated 0 4 } **Castle** (3711′ B.)	1	1	277	1
Shale, with sandstone streaks	13	2	290	3
Sandstone	6	7	296	10
Coal (3691′ B.)	0	4	297	2
Fire clay	1	7	298	9
Sandstone, hard, to bottom	7	3	306	0

W. Va. Pulp & Paper Co. No. 13 (64) Coal Test Boring.

Huttonsville District; on south side of Stonecoal Run, 0.2 mile above mouth and 1.9 miles northwest of Cheat Bridge; elevation, 3615′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (100′ 0″)				
Sand and boulders	5	0	5	0
Coal, Castle, slaty (3607′ B.)	2	6	7	6
Shale and wash	17	5	24	11
Shale, sandy	2	6	27	5
Sandstone, Guyandot, dark	2	7	30	0
Coal, Sewell "B" (3584′ B.)	0	6	30	6
Fire clay	1	0	31	6
Shale, sandy	6	6	38	0
Sandstone, brown	1	2	39	2
Bone and coal, Sewell "A" (3576′ B.)	0	3	39	5
Shale, dark	1	0	40	5
Sandstone, Lower Guyandot	33	1	73	6
Shale, Hartridge, sandy	7	8	81	2

				Thickness. Ft.	In.	Total. Ft.	In.
Coal	0′	1″	Sewell (Sharon (3523′ B.)	10	10	92	0
Bone	0	1					
Coal	1	0					
Coal	1	10					
Coal, bony	0	3					
Slate	0	6					
Laminated coal and bone	1	0					
Slate	0	8					
Coal, bony	0	6					
Slate	0	7					
Laminated coal and bone	0	9					
Slate	2	4					
Laminated coal and bone	0	4					
Slate	0	4					
Laminated coal and bone	0	7					
Slate, dark				3	0	95	0
Shale				2	6	97	6
Sandstone, with conglomerate streaks				2	0	99	6
Shale, to bottom				0	6	100	0

W. Va. Pulp & Paper Co. No. 14 (65) Coal Test Boring.

Huttonsville District; on south side of Yokum Run 1.6 miles above mouth and 1.3 miles northwest of Linan Mine; elevation, 3585′ B.

				Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (247′ 11″)							
Surface				17	0	17	0
Sandstone, hard				16	4	33	4
Coal, (wash, 1′ 2″), Castle (3550′ B.)				1	11	35	3
Fire clay (wash, 0′ 9″)				1	6	36	9
Shale, sandy				18	0	54	9
Sandstone, Lower Guyandot, hard, streaked with shale				17	8	72	5
Shale, with hard sandstone streaks				20	9	93	2
Slate, Hartridge Shale				21	11	115	1
Coal and slate	0′	3″	Sewell (Sharon) (3464′ B.)	5	11	121	0
Coal, good, soft	1	3					
Slate	2	11					
Coal, good, soft	1	6					
Slate, streaked with coal				1	4	122	4
Fire clay				0	5	122	9
Shale				5	9	128	6
Slate				3	5	131	11
Sandstone, Upper Raleigh (Sharon), pebbly, with a few streaks of slate and coal spars				59	9	191	8
Coal, slaty	0′	11″	Beckley (3391′ B.)	2	1	193	9
Slate	0	10					
Coal, slaty	0	4					

	Thickness. Ft.	In.	Total. Ft.	In.
Slate	0	1	193	10
Sandstone, hard	5	1	198	11
Shale, sandy and sandstone	4	6	203	5
Coal, Fire Creek (3380′ B.)	1	5	204	10
Fire clay	5	2	210	0
Slate	3	8	213	8
Sandstone	0	7	214	3
Shale, sandy	2	9	217	0
Coal, Little Fire Creek (3367′ B.)	0	9	217	9
Shale and sandstone	5	8	223	5
Slate, black	0	11	224	4
Sandstone, to bottom	23	7	247	11

At the southern end of Rich Mountain west of Tygart Valley three holes have been drilled on the Ward and Hutton tract, one of which is in Huttonsville District. These holes have been listed in former reports of the Survey touching on this territory but the records have not been previously released. They are now incorporated in the present Report through the kindness of Mr. George Ward, of Mill Creek, and other owners of the property. The hole situated in Huttonsville District is as follows:

Ward & Hutton No. 2 (66) Coal Test Boring.

Huttonsville District; on a branch of Mill Creek 1.2 miles southward from Whitman Knob and 4.7 miles west of Spangler; drilled by Berwind-White Coal Mining Company; elevation, 3605′ B.

				Thickness. Ft.	In.	Total. Ft.	In.
Surface				7	0	7	0
Sandstone				9	0	16	0
Shale, dark				14	0	30	0
Shale, sandstone parting				6	0	36	0
Sandstone, Eagle				52	0	88	0
Shale, dark				5	5	93	5
Shale, sandstone parting				2	7	96	0
Sandstone				3	0	99	0
Shale, dark				1	0	100	0
Sandstone, Lower Gilbert				21	0	121	0
Coal	0′	11″	**Gilbert**	4	0	125	0
Fire clay	3	0					
Coal, bony	0	1					
Fire clay, shaly				3	7	128	7
Shale, sandy				2	6	131	1
Sandstone, Upper Nuttall				85	0	216	1
Slate, black				0	2	216	3
Coal	1′	3″	**Iaeger "B"**	4	6	220	9
Coal, bony	0	5					
Fire clay, shaly	1	2					
Coal, bony	0	2					
Fire clay	1	0					
Coal	0	6					

	Thickness. Ft.	In.	Total. Ft.	In.
Fire clay	0	3	221	0
Shale, light	14	0	235	0
Sandstone 2′ 0″; Shale, sandstone parting 12 0 } Lower Nuttall	14	0	249	0
Fire clay	3	0	252	0
Shale, dark	15	0	267	0
Shale, sandstone parting	6	6	273	6
Coal 0′ 2″; Binder 0 1; **Coal** 0 7 } **Hughes Ferry**	0	10	274	4
Fire clay	2	3	276	7
Sandstone	6	0	282	7
Shale, sandstone parting	11	0	293	7
Shale, dark	18	0	311	7
Sandstone	4	8	316	3
Shale, sandy	11	1	327	4
Fire clay	5	0	332	4
Shale, sandy	17	0	349	4
Sandstone	1	0	350	4
Shale, sandy	3	3	353	7
Sandstone	1	6	355	1
Shale, sandy	1	0	356	1
Sandstone, Harvey	21	0	377	1
Shale, dark	0	11	378	0
Shale, Castle	1	8	379	8
Fire clay	0	2	379	10
Shale, sandstone parting	8	0	387	10
Shale, dark	12	6	400	4
Fire clay	2	6	402	10
Shale, light	2	6	405	4
Shale, sandstone parting	25	0	430	4
Shale, light 5′ 0″; Shale, dark 1 0 } **Skelt**	6	0	436	4
Coal 0′ 1″; Bone binder 0 2; **Coal** 1 8; **Coal, bony** 0 2 } **Sewell "B"**	2	1	438	5
Fire clay	5	0	443	5
Shale, dark	10	0	453	5
Shale, light	6	6	459	11
Sandstone, Lower Guyandot	4	0	463	11
Shale, Hartridge, sandy	5	0	468	11
Coal, Sewell (Sharon)	1	7	470	6
Fire clay	5	0	475	6
Shale, light	11	0	486	6
Shale, sandstone parting	5	0	491	6
Shale, dark	7	6	499	0
Fire clay, shaly	0	7	499	7
Slate, black	2	5	502	0
Coal, bony	0	7	502	7
Fire clay	0	2	502	9
Shale, light	1	0	503	9
Sandstone	2	6	506	3

		Thickness. Ft.	In.	Total. Ft.	In.
Shale, sandstone parting		1	0	507	3
Shale, light		6	6	513	9
Shale, dark		7	3	521	0
Shale, light		6	0	527	0
Sandstone, Welch, crystallized		10	0	537	0
Coal 0' 4"; Shale, sandstone parting 7 0; Coal 0 11	Welch Coal	8	3	545	3
Fire clay		5	0	550	3
Shale, sandy		5	0	555	3
Shale, dark		6	0	561	3
Shale, light		0	9	562	0
Sandstone, Upper Raleigh (Sharon)		39	0	601	0
Shale, light		5	0	606	0
Coal, Fire Creek		3	2	609	2
Fire clay, to bottom of hole		8	4	617	6

DETAILED COAL TEST RECORDS, MINGO DISTRICT.

In Mingo District, which covers parts of the Rich and Point Mountain territory and part of the Shavers Fork country, as well as an area of coal land south of Elk River, three tests for coal have been bored. The two following records, near the head of Mill Creek at the junction of Rich and Point Mountains, have been recently released by the Ward and Hutton interests, as previously mentioned:

Ward & Hutton No. 1 (67) Coal Test Boring.

Mingo District; on ridge at the heads of Stony and Limekiln Runs of Elkwater Fork of Tygart River 4.3 miles west of Spangler; drilled by Berwind-White Coal Mining Company; elevation, 3780' B.

		Thickness. Ft.	In.	Total. Ft.	In.
Surface		7	0	7	0
Sandstone, Eagle		39	0	46	0
Sandstone, coal spars		2	0	48	0
Sandstone, light 36' 6"; Sandstone and shale 3 3; Sandstone, light 3 3; Sandstone 2 4; Sandstone, light 7 5	Lower Gilbert	52	9	100	9
Soapstone		1	3	102	0
Coal, slaty 0' 3"; Soapstone 0 3; Coal 0 4	Gilbert	0	10	102	10

	Thickness. Ft.	Thickness. In.	Total. Ft.	Total. In.
Shale, light, sandy	9	8	112	6
Sandstone and shale 8' 0"				
Sandstone, light 17 6				
Sandstone, coal spars 1 0				
Sandstone, coal spars 15 6				
Sandstone, light 10 3				
Sandstone, coal spars 2 9				
Upper Nuttall Sandstone	55	0	167	6
Shale, dark, sandy	4	1	171	7
Coal, Iaeger "B"	1	2	172	9
Soapstone	2	0	174	9
Shale, light	21	6	196	3
Shale, dark, sandy	14	3	210	6
Shale, light, sandy	7	6	218	0
Slate, black	0	11	218	11
Coal, slaty	0	9	219	8
Slate, black	0	7	220	3
Fire clay	5	0	225	3
Shale, dark, sandy	18	3	243	6
Shale and sandstone 6' 6"				
Sandstone, light 18 3				
Sandstone, coal spars 5 9				
Lower Nuttall	30	6	274	0
Shale, Upper Iaeger, dark, sandy	4	0	278	0
Slate, dark	0	1	278	1
Coal, Hughes Ferry	2	2	280	3
Fire clay	3	0	283	3
Shale, dark	24	0	307	3
Coal, Lower Iaeger	0	1	307	4
Fire clay	1	6	308	10
Shale and sandstone, **Harvey Sandstone**	26	0	334	10
Coal 1' 9"				
Binder 0 2				
Coal 0 1				
Castle	2	0	336	10
Fire clay	5	7	342	5
Shale, dark	14	0	356	5
Fire clay	5	0	361	5
Sandstone	28	8	390	1
Coal	0	1	390	2
Fire clay	1	7	391	9
Coal, slaty	0	2	391	11
Fire clay	0	9	392	8
Coal, slaty	0	3	392	11
Fire clay	0	3	393	2
Sandstone 5' 3"				
Shale and sandstone 8 6				
Guyandot Sandstone	13	9	406	11
Shale, Skelt, dark	3	9	410	8

		Thickness. Ft.	In.	Total. Ft.	In.
Coal 0′ 6″ Binder 0 1 Coal 0 3 Fire clay 1 7 Coal 0 4 Fire clay 6 6 Coal 0 3	Sewell "B"	9	6	420	2
Fire clay		3	0	423	2
Sandstone, Lower Guyandot		10	0	433	2
Coal 1′ 7″ Coal, bony 0 6 Coal 1 6 Coal, bony 0 5	Sewell (Sharon)	4	0	437	2
Fire clay, shaly		2	0	439	2
Shale, dark		19	0	458	2
Coal		0	2	458	4
Shale, sandy		6	0	464	4
Fire clay		1	8	466	0
Shale and sandstone, Welch		6	6	472	6
Coal, Welch		1	10	474	4
Fire clay		4	0	478	4
Shale, dark		5	5	483	9
Shale, sandy		2	0	485	9
Shale, dark		2	0	487	9
Coal		0	4	488	1
Fire clay		3	0	491	1
Shale, light		2	0	493	1
Shale, black		8	0	501	1
Fire clay		6	0	507	1
Coal		0	9	507	10
Fire clay		5	0	512	10
Sandstone, Upper Raleigh (Sharon)		4	2	517	0
Shale, sandy		1	6	518	6
Slate, black		7	0	525	6
Coal 0′ 7 ″ Fire clay, coal spars 2 7 Coal, bony 0 3 Coal 0 6 Fire clay, shaly 0 7½ Coal 0 0½ Fire clay 0 2 Coal 0 3 Fire clay, shaly 0 8 Coal 0 2 Fire clay, shaly 0 11 Coal, bony 0 1 Fire clay, shaly 0 3 Coal, bony 0 4	Fire Creek Coal	7	5	532	11
Fire clay		5	0	537	11
Shale, dark		16	0	553	11
Fire clay		0	1	554	0

	Thickness. Ft.	In.	Total. Ft.	In.
Princeton Sandstone: Shale and sandstone 17′ 0″; Sandstone 6 0; Shale, dark 2 6; Sandstone 0 8; Shale, dark 0 3; Sandstone 1 0	27	5	581	5
Fire clay, shaly	0	7	582	0
Coal, Pluto	0	2	582	2
Fire clay	8	0	590	2
Shale, dark	0	6	590	8
Fire clay, shaly	9	0	599	8
Red shale, to bottom of hole	1	4	601	0

Ward & Hutton No. 3 (68) Coal Test Boring. (On Hogan Place).

Mingo District; on ridge between Vandevender Fork and Back Fork of Elk River 0.8 mile northeast of mouth of Vandevender Fork and 5.5 miles southeast of Pickens; drilled by Berwind-White Coal Mining Company; elevation, 3390′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Surface	29	0	29	0
Sandstone	0	9	29	9
Sandstone and shale	10	6	40	3
Shale, dark	1	8	41	11
Coal	0	1	42	0
Fire clay	5	0	47	0
Shale, light	3	0	50	0
Shale, dark	13	0	63	0
Sandstone, Lower Gilbert	26	0	89	0
Shale, dark	25	0	114	0
Coal, Gilbert	1	10	115	10
Fire clay, shaly	2	6	118	4
Shale, dark	46	0	164	4
Slate, black	0	6	164	10
Coal, Lower Douglas	1	8	166	6
Fire clay	4	0	170	6
Fire clay, shaly	2	0	172	6
Shale, dark	9	0	181	6
Sandstone	8	6	190	0
Fire clay, shaly	2	6	192	6
Slate, black	0	4	192	10
Fire clay	0	2	193	0
Sandstone and shale, **Lower Nuttall**	16	0	209	0
Shale, Upper Iaeger, dark	2	3	211	3
Coal, Hughes Ferry	0	6	211	9
Fire clay, sandy	2	0	213	9
Shale	1	6	215	3
Sandstone, Middle Iaeger	22	0	237	3
Shale, dark	3	0	240	3
Sandstone	0	8	240	11
Shale, dark	5	6	246	5
Coal, Lower Iaeger	0	6	246	11

				Thickness. Ft.	In.	Total. Ft.	In.
Fire clay, shaly				3	0	249	11
Shale, light	5′	6″	Lower Iaeger Shale	12	6	262	5
Sandstone	3	0					
Shale, dark	2	0					
Shale, light	2	0					
Sandstone	17′	7″	Harvey	21	6	283	11
Sandstone	1	5					
Sandstone	2	6					
Shale, dark				13	5	297	4
Coal, bony				0	1	297	5
Fire clay, shaly				4	0	301	5
Shale, Sandy Huff, dark				5	0	306	5
Coal, Castle				2	1	308	6
Fire clay, shaly				14	0	322	6
Shale, light				4	0	326	6
Shale, dark				1	6	328	0
Sandstone				1	3	329	3
Shale, dark				1	4	330	7
Sandstone				0	2	330	9
Shale, dark				4	4	335	1
Sandstone, coal spars				2	9	337	10
Coal, bony				0	2	338	0
Shale, dark				0	6	338	6
Coal, bony				0	1	338	7
Fire clay				3	0	341	7
Coal, bony				0	3	341	10
Coal				0	4	342	2
Shale, dark				0	10	343	0
Coal				0	1	343	1
Sandstone, Guyandot				2	6	345	7
Shale, dark				0	3	345	10
Coal	0′	2″	Sewell "B"	10	0	355	10
Shale, dark	0	5					
Coal	2	3					
Fire clay, dark, shaly	1	4					
Coal, bony	0	2					
Fire clay, shaly	3	11					
Coal	0	1					
Coal, bony	0	1					
Coal	1	7					
Fire clay				1	2	357	0
Shale, dark				1	1	358	1
Sandstone	1′	11″	Lower Guyandot Sandstone	11	4	369	5
Shale, light	6	0					
Sandstone	3	5					
Shale, Hartridge, light				4	4	373	9
Coal, bony	0′	5″	Sewell (Sharon)	9	5	383	2
Coal	0	4					
Coal, bony	0	7					
Coal	1	1					
Fire clay	5	0					
Coal, bony	2	0					
Fire clay				1	6	384	8

	Thickness. Ft.	In.	Total. Ft.	In.
Shale, light	4	0	388	8
Shale, dark	2	0	390	8
Fire clay, shaly	1	4	392	0
Sandstone, Upper Raleigh (Sharon), crystallized	20	0	412	0
Shale, light	3	0	415	0
Shale, hard, blue	11	0	426	0
Shale, green, hard	18	0	444	0
Shale, hard, dark	15	0	459	0
Shale, green, hard	10	0	469	0
Shale, dark	3	4	472	4
Coal	0	1	472	5
Fire clay	0	2	472	7
Shale, light	5	0	477	7
Coal	0	1	477	8
Fire clay	4	4	482	0
Shale, green, hard	2	0	484	0
Fire clay, green	5	0	489	0
Shale, green, hard	21	0	510	0
Sandstone, Princeton, hard	33	0	543	0
Coal, bony 0′ 2″ / Sandstone 1 10 / Coal, bony 0 10 } Pluto	2	10	545	10
Shale, green	23	8	569	6
Shale, red	1	6	571	0

The following hole, located in the Shavers Fork territory, was drilled by the West Virginia Pulp and Paper Company on its own lands many years ago:

W. Va. Pulp & Paper Co. No. 1 (69) Coal Test Boring.

Mingo District; on Snyder Knob of Cheat Mountain, 0.7 mile west of Hopkins; elevation, 4441′ B.

	Thickness. Ft.	In.	Total. Ft.	In.
Pottsville Series (380′ 7″)				
Sandstone, Lower Gilbert	31	6	31	6
Coal 0′ 6″ / Sandstone 0 10 / Coal 4 4 } Gilbert (4404′ B.)	5	8	37	2
Fire clay	6	0	43	2
Sandstone, Dotson and Nuttall	136	0	179	2
Slate	20	0	199	2
Fire clay	15	0	214	2
Slate and coal, mixed, Sewell (Sharon) (4226′ B.)	1	3	215	5
Sandstone, Guyandot	40	0	255	5
Fire clay	12	0	267	5
Slate and coal, mixed, Sewell, (Sharon) (4168′ B.)	6	0	273	5
Fire clay	6	0	279	5
Sandstone, Upper Raleigh (Sharon)	70	8	350	1
Fire clay	8	6	358	7
Sandstone	22	0	380	7

	Thickness. Ft.	In.	Total. Ft.	In.
Mauch Chunk Series (113′ 6″)				
Shale, red	16	0	396	7
Shale, blue	8	6	405	1
Sandstone, conglomerate	3	0	408	1
Shale, red	14	0	422	1
Shale, conglomerate, red	3	0	425	1
Shale, red	5	0	430	1
Shale, blue	64	0	494	1

DETAILED COAL TEST RECORDS, DRY FORK DISTRICT.

In Dry Fork District no tests for coal have been bored but in the Stony River Basin which passes through the northeastern corner of the district four tests were once made on the Robert Bridges Heirs in Dry Fork District, Tucker County, only a few miles north of the Randolph line. These locations are outside the limits of Map II and hence are not shown but the record of **Bridges No. 2** is pub'ished in connection with the Stonecoal Run of Red Creek Section, pages 201-2, and that of **Bridges No. 4** is used in the Red Creek Section, pages 203-4. The records of **Bridges Nos. 1 and 3** may be consulted in the Tucker County Report of the Survey, pages 357-8.

MINABLE COALS OF THE CONEMAUGH SERIES.

BAKERSTOWN (THOMAS) COAL.

Bakerstown (Thomas) Coal, Dry Fork District.

In the discussion of the Conemaugh Series, page 221, it has been stated that there is a possibility of finding Bakerstown (Thomas) Coal along the Stony River Syncline southeast of Laneville, but that no borings or prospects are available to show its thickness and character. The outcrop of the coal, as figured by planimeter on Map II, covers 2.875 square miles, or 1,840 acres. If a recoverable thickness of two feet of clean coal should be found, as has been estimated in Dry Fork District, Tucker County, farther north in the same basin, there would be 6,412,320 short tons of coal.

MINABLE COALS OF THE ALLEGHENY SERIES.

UPPER FREEPORT (DAVIS) COAL.

Upper Freeport (Davis) Coal, Dry Fork District.

In the stratigraphic discussion of the Upper Freeport (Davis) Coal, page 226, it has been stated that it has not been found in minable thickness in the western part of the county west of Laurel Ridge and Rich Mountain. In Dry

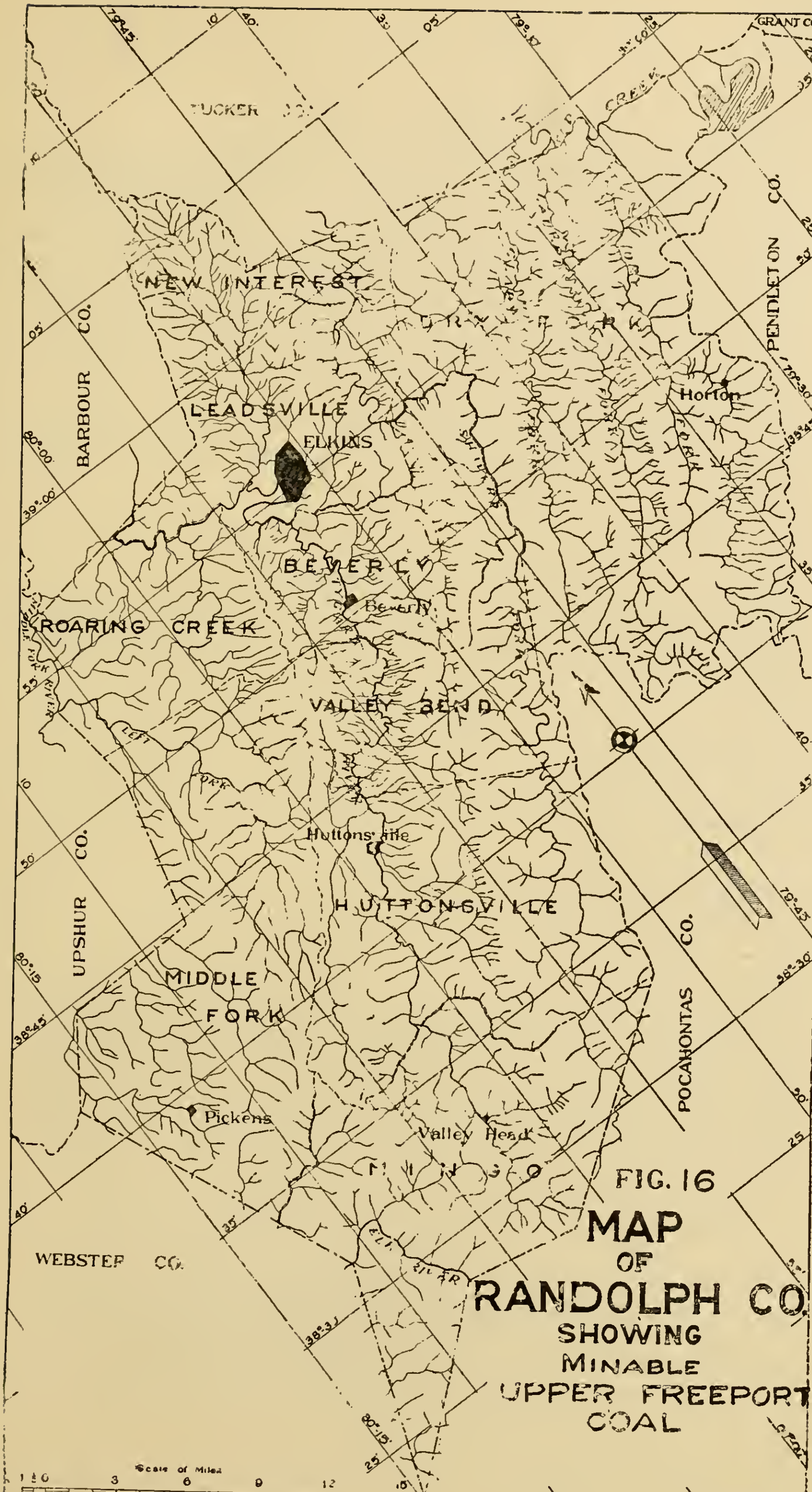


FIG. 16

MAP OF RANDOLPH CO. SHOWING MINABLE UPPER FREEPORT COAL

Fork District there are no openings but just to the northward in Tucker County it was once mined locally in the Stony River Basin and several core tests have been bored through its horizon, affording rather good information. It would appear that the data on this country immediately north of Red Creek should apply equally as well to the Randolph territory south of the creek. Its outcrop is therefore delineated for this basin on Map II, and Figure 16 shows at a glance its supposed minable area.

The following measured section of an old mine in the edge of Tucker County shows the nature of the coal in this basin:

Robert Bridges Heirs Mine.

Dry Fork District, Tucker County; on the west side of Stonecoal Run of Red Creek, 3.2 miles northeast of Laneville; Upper Freeport (Davis) Coal; elevation, 3660' B.

				Ft.	In.
1.	Shale, black				
2.	Coal, soft	1'	9"		
3.	Shale, gray	1	4		
4.	Coal, cannel bone	1	10		
5.	Shale, gray	0	10		
6.	Coal, soft	1	3		
7.	Coal, bony	0	4		
8.	Coal, soft	0	10	8	2
9.	Shale, pavement				

A sample (No. 455R) was collected from Nos. 2, 6, and 8 of section the composition of which is published in the Table of Coal Analyses at the end of this Chapter. This sample was taken near the mine mouth and its analysis reveals a high content of ash. There may be better coal farther underground but access could not be had to the old workings.

Quantity of Upper Freeport (Davis) Coal Available.

The following table, compiled by Grow from a planimetric determination of the outcrops on Map II, for the areas designated on Figure 16, shows the probable amount of Upper Freeport (Davis) Coal in the county:

Probable Amount of Upper Freeport (Davis) Coal.

District.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Dry Fork	3	4.275	2,736	357,540,480	14,301,619

UPPER KITTANNING COAL.

The Upper Kittanning Coal, previously discussed in Chapter VI, page 228, occurs in some quantity in Roaring Creek District in the western edge of the county, its outcrop being delineated for that territory on Map II and its minable area being exhibited on Figure 17. Generally it is a soft, double-bedded seam, varying from two to five feet in thickness, with a single small slate parting, but occasionally it has greater thickness with more partings, as seems to be the case in Randolph County where it has been prospected only to a small extent. In the Laneville territory of the Stony River Basin the evidence secured in the adjacent portion of Tucker County would indicate that it does not have minable thickness.

Upper Kittanning Coal, Roaring Creek District.

In the northern end of Roaring Creek District a few exposures of the Upper Kittanning Coal were noted but it has not been generally opened in the region of its crop. At Coal Exposure No. 1 on Map II, on the head of Big Laurel Run of Tygart River 0.3 mile southeast of Kingsville, the coal is exposed in the public road at elevation 2405′ B., showing a heavy blossom, six to seven feet thick. The following opening apparently represents the Upper Kittanning, as it comes 40 feet above the Lower Kittanning, but differs radically from the bed-section usually found in the adjacent portions of Barbour and Upshur where it has frequently been prospected:

Mike King Farm Mine—No. 2 on Map II.

On Big Laurel Run of Tygart River, 1.3 miles northeast of Pumpkintown; Upper Kittanning Coal; elevation, 2320′ B.

	Ft.	In.
1. Slate, dark		
2. Coal, soft	1′	9″
3. Shale, gray	1	6

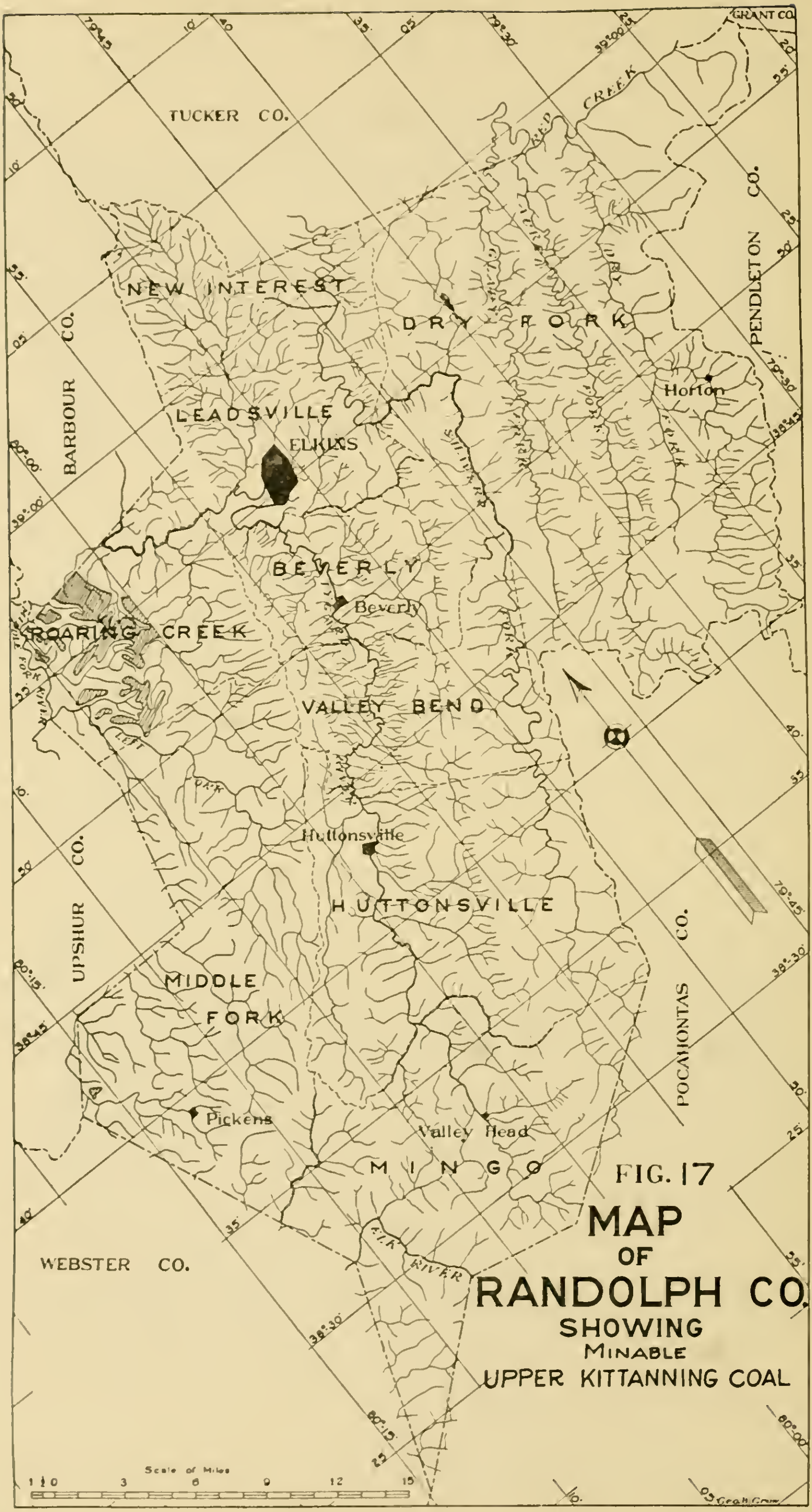


FIG. 17

MAP OF RANDOLPH CO. SHOWING MINABLE UPPER KITTANNING COAL

		Ft.	In.	Ft.	In.
4.	Coal, soft	1	2		
5.	Slate, black	0	2		
6.	Coal	0	3		
7.	Slate, black, bony	0	10		
8.	Coal, soft	2	0		
9.	Slate, reported	0	8		
10.	Coal, reported	2	0	10	4

Quantity of Upper Kittanning Coal Available.

The following table, compiled by R. C. Tucker from a planimetric measurement of the areas indicated on Map II and Figure 17, indicates the available amount of Upper Kittanning Coal in the county:

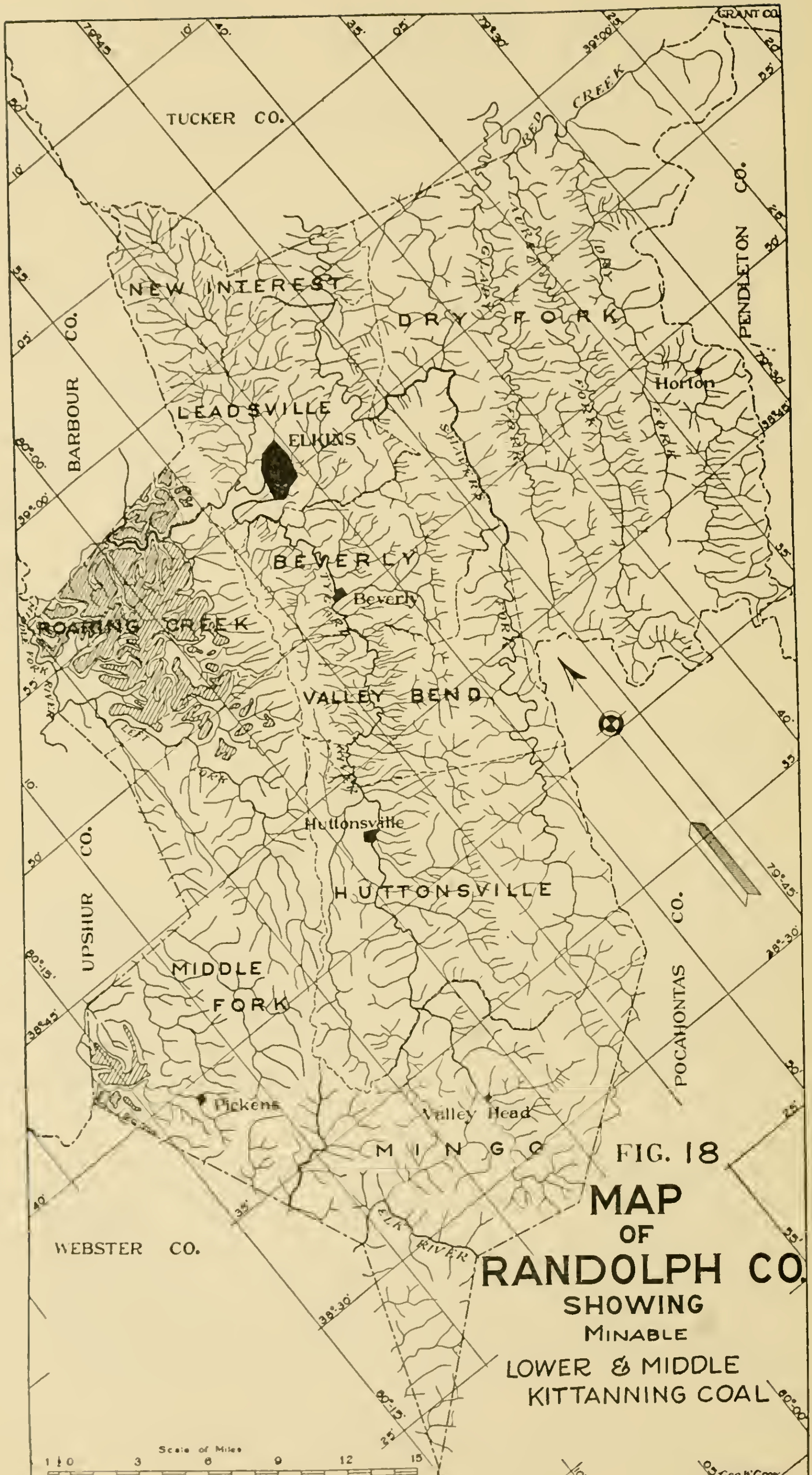
Probable Amount of Upper Kittanning Coal.

District.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal.
Roaring Creek	3	7.95	5,088	664,899,840	26,595,994

MIDDLE AND LOWER KITTANNING COALS.

The Middle and Lower Kittanning Coals, previously discussed in Chapter VI, page 230, cover a considerable territory in Roaring Creek and Middle Fork Districts, in the former of which they have long been mined. Their horizons also occur in the Stony River Basin near Laneville but they have not been prospected; and in the adjacent portion of Tucker County where exposures are better and where there have been borings these two coals are too thin for mining and hence they are not considered to be of value in the Randolph County part of the basin.

These coals, which in some regions are separated by an interval of 25 to 50 feet, occur in such close proximity in the western part of the county that they are usually mined as a single seam, being separated by only a few feet of shale at most localities, and being herein discussed as a single bed. In a few localities, however, the parting thickens and they are then recognizable as distinct coals. In the Roaring Creek region, where active mining has been practiced, the combined seam is often 7 to 12 feet thick, with two or three streaks of shale or bone, and with several benches of clean, soft,


TUCKER CO.
BARBOUR CO.
UPSHUR CO.
WEBSTER CO.
PENDLETON CO.
POCAHONTAS CO.
GRANT CO.
NEW INTEREST
LEADSVILLE
DRY FORK
BEVERLY
ROARING CREEK
VALLEY BEND
HUTTONSVILLE
MIDDLE FORK
MINGO
Elkins
Beverly
Horton
Huttonsville
Pickens
Valley Head
RED CREEK
ELK RIVER
Scale of Miles
FIG. 18
MAP OF RANDOLPH CO. SHOWING MINABLE LOWER & MIDDLE KITTANNING COAL

columnar coal. Figure 18 shows the minable extent, and on Map II the outcrop is delineated in detail.

Middle and Lower Kittanning Coals, Roaring Creek District.

In Roaring Creek District the Middle and Lower Kittanning Coals have been mined extensively along Roaring Creek, where they combine to form one large seam, 8 to 10 feet thick. In the western part of the district, toward Upshur County, they are separated by an interval of several feet of shale, slate, and sandstone, and the two beds have deteriorated individually, with the result that they have been mined in that region mainly for local domestic use.

At the northern end of the district, the coal has been opened at **Farm Mine No. 3 on Map II,** on Tygart River 0.2 mile south of Findley, where it has a total thickness of 9′ 0″, at elevation 2085′ B., as shown in detail in the Findley Section, page 128. The **Coal & Coke Railway Exposure (No. 4 on Map II),** on Big Laurel Run, 0.9 mile north of Loop Station, showed five to six feet of coal and slate at elevation 2110′ B. The following exposure was noted at the east portal of the Kingsville Tunnel:

Coal and Coke Railway Exposure—No. 5 on Map II.

On Little Laurel Run of Tygart River, 0.8 mile southeast of Kingsville Station; Middle and Lower Kittanning Coals; elevation, 2195′ B.

	Ft.	In.
1. Coal, Middle Kittanning	3	0
2. Shale, sandy	8	0
3. Coal, Lower Kittanning (2195′ B.)	2	0
4. Slate, dark	6	0
5. Coal, streak, Clarion	0	6
6. Sandstone, to grade	10	0

The **John Higgins Farm Mine (No. 6 on Map II),** located on Big Laurel Run 1.1 miles northeast of Pumpkintown at an elevation of 2275′ B., had partly fallen shut, but the Lower Kittanning was reported 7 feet thick, only three feet being visible. The following opening shows the Middle Kittanning on the same farm:

John Higgins Farm Mine—No. 7 on Map II.

On Big Laurel Run, 1.2 miles northeast of Pumpkintown; Middle Kittanning Coal; elevation, 2310′ B.

				Ft.	In.
1.	Coal blossom and black slate				
2.	Coal, cannelly	0′	10″		
3.	Coal, soft	2	0		
4.	Coal, bony	1	2		
5.	Coal, soft	1	4	5	4
6.	Slate, pavement				

The coal has been mined extensively along Tygart River between Leiter and Norton, the operations having been mainly started by the Davis Colliery Company which has now been succeeded by the West Virginia Coal and Coke Company. These mines were examined and sampled in 1915, the stratigraphic and chemical data being herein republished without attempt at revision of general mine information on haulage, employment of miners, tonnage, and shipment of coal and other items. These items would now be out of date and hence all such details are omitted. This company now has headquarters at Omar, West Virginia, but still maintains an office in Elkins where the revision of mine numbers was obtained for insertion where practicable. Some of these mines are as follows:

Davis Colliery Company, Sivad No. 5B Mine (Now West Virginia Coal and Coke Company)—No. 8 on Map II.

On Tygart River, 0.8 mile southwest of Harding; Middle and Lower Kittanning Coals; elevation, 2020′ B.

				Ft.	In.
1.	Slate				
2.	Coal	0′	5″		
3.	Slate	0	5		
4.	Coal	3	2		
5.	Slate	1	6		
6.	Coal	2	10	8	4
7.	Slate, pavement				

"Greatest rise, west; sample collected in Main Heading, 150 feet from mine mouth, from Nos. 2, 4, and 6 of section, by D. D. Teets, Jr."

The composition of this sample is published under Mine No. 8 in the Table of Coal Analyses at the end of this Chapter.

Davis Colliery Company, Sivad No. 5 Mine (Now West Virginia Coal and Coke Company)—No. 9 on Map II.

On Tygart River, 0.3 mile west of Harding; **Middle and Lower Kittanning Coals**; elevation, 1990′ B.

				Ft.	In.
1.	Slate, dark				
2.	Coal, soft	1′	11″		
2.	Slate, black	0	4		
4.	Coal, soft	0	4		
5.	Slate, black	0	6		
6.	Coal, soft	3	1		
7.	Slate, black	0	6		
8.	Coal	1	8	8	4
9.	Slate, pavement				

The coal was once opened on the Tygart River just northwest of Norton at the **Davis Colliery Company No. 5 Mine (now West Virginia Coal and Coke Company) (No. 10 on Map II)**, known as the "Coaling Station" and being a southern outlet for the No. 5 Mine and used to wagon coal to the town of Norton. Here the coal exhibits a thickness of 6′ 7″, as published in detail in the Norton Section, page 129, its elevation being 2030′ B.

Davis Colliery Company, Sivad No. 2 Mine (Now West Virginia Coal and Coke Company No. 2)—No. 11 on Map II.

On Grassy Run, 0.7 mile south of Norton; **Middle and Lower Kittanning Coals**; elevation, 2030′ B.

				Ft.	In.
1.	Slate				
2.	Coal	1′	6 ″		
3.	Slate	0	0½		
4.	Coal	0	3½		
5.	Slate	0	1		
6.	Coal	3	4		
7.	Slate	0	4		
8.	Coal	1	10	7	5
9.	Slate				

"Greatest rise, south; sample collected from Nos. 2, 4, 6, and 8 of section, in Room No. 2 off 2nd Right, by D. D. Teets, Jr."

The composition of this sample is published under **Mine No. 11** in the Table of Coal Analyses at the end of this Chapter.

The following opening along Roaring Creek near the

Belington Syncline was one of the original farm mines used for local fuel prior to commercial development:

Edwin Scott Farm Mine—No. 12 on Map II.

On Roaring Creek, 0.6 mile southeast of Norton; Middle and Lower Kittanning Coals; elevation, 2050′ B.

				Ft.	In.
1.	Slate, black, cannel			1	6
2.	Shale, dark			1	0
3.	Coal, soft	3′	2″		
4.	Coal, bony	0	5		
5.	Coal, soft	3	1		
6.	Slate, dark	0	7		
7.	Coal, medium-hard	1	5	8	8
8.	Slate, pavement				

The West Virginia Coal and Coke Company Prospect (No. 13 on Map II), located on a branch of Roaring Creek 0.5 mile north of Coalton Store at elevation 2175′ B., had fallen shut when visited by the writer in 1926 and no section was secured.

Coal and Coke Railway Exposure—No. 14 on Map II.

On Roaring Creek, at the west edge of Coalton; Middle and Lower Kittanning Coals; elevation, 2175′ B.

				Ft.	In.
1.	Shale, sandy			15	0
2.	Slate, black, bony			1	6
3.	Slate, dark			1	6
4.	Coal, soft	3′	3″		
5.	Slate, dark	0	2		
6.	Coal, soft	3	2	6	7
7.	Shale, gray, and concealed			2	0
8.	Sandstone, shaly			10	0
9.	Concealed to creek			15	0

The Davis Colliery Company, now succeeded by the West Virginia Coal and Coke Company, has operated a large coal mine and coke yard at Coalton, the coal being handled from a central tipple that serves the openings on either side of the small branch of Roaring Creek on which they are located. The following measurements were made in these mines:

Davis Colliery Company, Coalton Mine No. 1 (No. 3 Opening) (Now West Virginia Coal and Coke Company No. 1)—No. 15 on Map II.

On the north side of a branch of Roaring Creek, at Coalton; Middle and Lower Kittanning Coals; elevation, 2190' B.

				Ft.	In.
1.	Slate				
2.	Top coal, bony	0'	10 "		
3.	Bone	0	1½		
4.	Coal	1	11		
5.	Slate, black	0	1		
6.	Coal	2	10½		
7.	Slate	0	3		
8.	Coal	1	6	7	7
9.	Slate, pavement				

"Butts, N. 85° E.; faces, N. 5° W.; greatest rise, southwest and southeast; sample collected from Nos. 2, 4, 6, and 8 of section in Room No. 31, on 2nd Right, by D. D. Teets, Jr."

The composition of this sample is published under Mine No. 15 in the Table of Coal Analyses at the end of this Chapter.

The following measurement was made at the opening south of the stream, the section of the main coal bed being made in the Gassaway Heading of the mine, while the lower strata were observed immediately below the mouth of the mine, next to the railroad track:

Davis Colliery Company, Coalton Mine No. 1 (Nos. 1 and 2 Openings) (Now West Virginia Coal and Coke Company No. 1)—No. 16 on Map II.

On the south side of a branch of Roaring Creek, at Coalton; Middle and Lower Kittanning Coals; elevation, 2190' B.

					Ft.	In.
1.	Second black slate, laminated					
2.	First black slate, cannel bone				2	8
3.	Shale, gray				1	4
4.	Coal, bony	1'	0 "	Middle and Lower Kittanning (2190' B.)	7	8
5.	Coal, soft	2	2½			
6.	Slate, dark	0	0½			
7.	Coal, soft	3	1			
8.	Slate, dark	0	4			
9.	Coal, soft	1	0			
10.	Fire clay				2	0
11.	Sandstone, shaly				8	0
12.	Shale, dark, sandy				5	0
13.	Coal, medium-hard, with lenticular streaks of slate, Upper Clarion				2	8
14.	Fire clay shale				4	0

				Ft.	In.
15. Coal, medium-hard	1′	4″	Lower Clarion	3	11
16. Coal, bony	0	7			
17. Coal, soft	2	0			
18. Slate, pavement, at railroad grade					

The above section reveals two coals of considerable thickness between the Lower Kittanning Coal and the Homewood Sandstone which belongs only a few feet below drainage at this point. It is barely possible that the main bed which is mined, Nos. 4-9 of section, represents only the Middle Kittanning Coal and that coal No. 13 of section should be called the true Lower Kittanning instead of Upper Clarion as named.

In 1916 the company had 250 beehive coke ovens and the following analyses of coal and coke from these operations were furnished the Survey, the coal analyses being by E. H. May and the coke analyses by F. S. Johnson, chemists:

Coalton Mines, Coal Analyses.

Sample No.	1	2	3	2510	2511	2512	2513
Moisture	0.30	0.45	0.50	1.35	1.32	1.17	1.50
Volatile Matter	29.70	30.80	31.15	29.92	30.44	31.33	27.60
Fixed Carbon	58.50	58.85	55.55	57.93	58.15	57.20	61.05
Ash	11.50	10.90	12.80	10.80	10.09	10.30	9.85
Totals	100.00	101.00	100.00	100.00	100.00	100.00	100.00
Sulphur	1.53	1.49	1.62	1.84	2.27	2.03	1.70

Sample No. 1, from Room 29, off 1st Left, off Heading 46, No. 1 Opening.
Sample No. 2, from 1st Left Heading, off Heading 46, No. 1 Opening.
Sample No. 3, from Room 3, off Air-Course 28.
Sample No. 2510, from Room 21, off 1st Right Heading, No. 3 Opening.
Sample No. 2511, from Room 26, off 1st Right Heading, No. 3 Opening.
Sample No. 2512, from Room 31, off 2nd Right Heading, No. 3 Opening.
Sample No. 2513, from Room 24, off 2nd Right Heading, No. 3 Opening.

Coalton Mines, Coke Analyses.

Sample No.	1	2	2836	2837	2838
Moisture	0.33	0.43	0.14	0.22	0.20
Volatile Matter	0.95	1.02	1.13	0.95	0.80
Fixed Carbon	83.20	82.68	81.88	82.06	82.60
Ash	15.52	15.87	16.85	16.77	16.40
Totals	100.00	100.00	100.00	100.00	100.00

Sample No. 1, average for the month of October, 1915.
Sample No. 2, average for the month of November, 1915.
Sample No. 2836, furnace coke, taken April 15, 1916.
Sample No. 2837, furnace coke, taken April 15, 1916.
Sample No. 2838, furnace coke, taken April 15, 1916.

One of the above mines was once examined and sampled by A. P. Brady and the results published in Volume II (A), page 513, and an interesting section made by Dr. White at the same place is published in the same volume, page 514.

The following mine, now abandoned, was located in the same vicinity:

W. H. Green, Leroy Mine—No. 17 on Map II.

On Roaring Creek, 0.5 mile southwest of Coalton; Middle and Lower Kittanning Coals; elevation, 2330' B.

			Ft.	In.
1. Coal, bony, thickness concealed				
2. Coal, soft	2'	11"		
3. Slate, dark	0	2		
4. Coal, soft	3	3		
5. Shale, gray	0	3		
6. Coal, soft	1	7	8	2
7. Slate, pavement, and concealed to Homewood Sandstone			35	0

Two commercial mines near Mabie show the following sections:

A. Spates Brady Mine—No. 18 on Map II.

On Roaring Creek, 0.7 mile northeast of Mabie; Middle and Lower Kittanning Coals; elevation, 2265' B.

			Ft.	In.
1. Slate				
2. Coal, bony	0'	11 "		
3. Coal	2	0		
4. Slate	0	0¾		
5. Coal	3	4		
6. Slate	0	4		
7. Coal	1	10¼	8	6
8. Slate				

"Greatest rise, southwest; sample collected in Room off 2nd Left by D. D. Teets, Jr."

The composition of this sample is published under Mine No. 18 in the Table of Coal Analyses at the end of this Chapter.

The mining section, as secured at the working face, does not show the entire section of the coal, the following measurement having been obtained at the mine mouth:

				Ft.	In.
1.	Shale, sandy			15	0
2.	Coal	2′	0″		
3.	Slate, dark	1	6		
4.	Coal, hard	1	0		
5.	Coal, soft	2	7		
6.	Slate, black	0	2		
7.	Coal, soft	3	4		
8.	Slate, dark	0	4		
9.	Coal, soft	1	9	12	8
10.	Slate, pavement				

J. B. Jenkins Coal & Coke Co. Mine—No. 19 on Map II.

On Roaring Creek, 0.3 mile south of Mabie; **Middle and Lower Kittanning Coals**; elevation, 2320′ B.

				Ft.	In.
1.	Slate				
2.	Coal, bony, visible	0′	9″		
3.	Coal	2	6		
4.	Slate, black	0	0¾		
5.	Coal	3	2		
6.	Slate	0	4		
7.	Coal	1	9		
8.	Slate	0	0¼		
9.	Coal	0	9	9	4
10.	Slate, pavement				

"Butts, N. 84° E.; faces, N. 6° W.; greatest rise, southwest; sample collected in Room No. 7, off 3rd Left, by D. D. Teets, Jr."

The composition of this sample is published under Mine No. 19 in the Table of Coal Analyses at the end of this Chapter.

The West Virginia Coal and Coke Company No. 6 Mine (No. 20 on Map II), located on the south side of Roaring Creek just southwest of Mabie, at elevation 2305′ B., was not in operation when visited by the writer in 1926 and no section or sample was secured.

Some other prospects and farm openings have been made farther south along the Belington Syncline, the following being noted:

Davis Colliery Company (Now West Virginia Coal and Coke Company) Prospect—No. 21 on Map II.

On a branch of Flatbush Fork of Roaring Creek, 0.2 mile southeast of Pumpkintown; **Lower Kittanning Coal**; elevation, 2455′ B.

				Ft.	In.
1.	Slate, dark				
2.	Coal	1′	3″		
3.	Coal, bony	0	10		
4.	Coal, soft	2	8	4	9
5.	Slate, pavement				

PLATE XLVII.—View of old mill site at Evenwood looking northwest down Laurel Fork. Foreground and middle topography are typical Catskill but in the extreme background Shavers Mountain, capped by Pottsville, is dimly visible. (Photo. by U. S. Forest Service.)

PLATE XLVIII.—Swallow Rock, a Catskill ledge along Gandy Creek above Horton. (Photo. by U. S. Forest Service.)

PLATE IL.—View looking northeast down Ralston Run about 1½ miles west of Valley Head showing Catskill topography and strata. (Photo. by E. E. Harris.)

PLATE L.—Close view of Catskill shale at Fossil Lot 410 along State road north of Ralston Run 1½ miles west of Valley Head. Hammer rests on abundant **Dimeripteris** zone. (Photo. by E. E. Harris.)

Arnold and Goff Farm Mine—No. 22 on Map II.

On Roaring Creek, 1.4 miles south of Mabie; **Middle and Lower Kittanning Coals**; elevation, 2435′ B.

				Ft.	In.
1.	Concealed				
2.	**Coal**	2′	2″		
3.	Slate, black	0	1½		
4.	**Coal**, soft	1	0		
5.	Bone, 0″ to	0	2		
6.	**Coal**, soft	1	10½		
7.	Slate, dark	0	5		
8.	**Coal**, soft	1	5	7	2
9.	Slate, pavement				

A few openings have been made on the waters of Middle Fork River in Roaring Creek District, the following having been noted:

Coal and Coke Railway Exposure—No. 23 on Map II.

On Devil Run, at west portal of Kingsville Tunnel, 0.6 mile south east of Kingsville; **Lower Kittanning Coal**; elevation, 2195′ B.

				Ft.	In.
1.	**Sandstone, East Lynn**, massive				
2.	**Coal**	4′	0″		
3.	Slate, gray	0	6		
4.	**Coal**	1	0	5	6
5.	Slate, dark			4	0
6.	**Coal**			1	0
7.	Shale, dark			8	0
8.	**Coal**, slaty			0	6
9.	Slate, dark, to grade			5	0

Joseph Bliny Farm Mine—No. 24 on Map II.

On Hell Run, 0.9 mile northwest of Kingsville; **Lower Kittanning Coal**; elevation, 2235′ B.

				Ft.	In.
1.	Sandstone, massive				
2.	**Coal**	0′	10″		
3.	Slate, dark	2	4		
4.	**Coal**, visible	1	6	4	8

Hamilton Markley Farm Mine—No. 24A on Map II.

On Hell Run, 0.2 mile southwest of Kingsville; Lower Kittanning Coal; elevation, 2250′ B.

				Ft.	In.
1.	Sandstone, roof				
2.	Coal	1′	0″		
3.	Coal, bony	0	10		
4.	Coal, soft	1	4		
5.	Slate	0	9		
6.	Coal	0	6	4	5
7.	Slate, pavement				

The Lower Kittanning was once opened at the **Wilbur Kimble Farm Mine (No. 25 on Map II)**, on Kettle Run, 2.6 miles southeast of Gale, at elevation 2440′ B., but the opening had fallen shut and its thickness was not learned.

Since field work was completed in the county it is reported by Mr. Claude W. Maxwell, of Elkins, that a considerable area of Middle Kittanning Coal has been opened along the Belington Syncline on the headwaters of Roaring Creek, presumably near the Roaring Creek-Middle Fork District line. According to Mr. Maxwell the seam is there separated from the Lower Kittanning by an interval of about 21 feet and has a thickness of four to seven feet of clean coal, estimated as covering about 3,000 acres.

Middle and Lower Kittanning Coals, Middle Fork District.

In Middle Fork District the southward rise along the Belington Syncline causes the entire Allegheny Series to pass above the topography south of the Whitman Flats southeast of Cassity. In this territory the only opening observed was the **G. A. Newlon Heirs Prospect (No. 26 on Map II)**, located on a branch of Cassity Fork 2.6 miles east of Cassity at elevation 2650′ B. This opening had fallen shut, but, according to R. O. Zirkle, the coal measured 6′ 6″ thick, with one inch of slate near the top of the seam.

In the region west of Pickens and Helvetia there should be some Lower Kittanning in the tops of certain high ridges, as indicated on Map II. So far as known this coal has not been prospected but it has frequently been opened with good thickness in the adjacent portions of Upshur and Webster Counties immediately to the westward.

Middle and Lower Kittanning Coals, Leadsville District.

In Leadsville District the Middle and Lower Kittanning Coals have a fine development, being apparently both represented in one large thick bed that has been mined extensively on a commercial scale. The coal in this region has a low sulphur content that has made it valuable for coking purposes. The three following mines have been operated along Beaver Creek:

Davis Coal and Coke Company, Weaver Mine No. 1—No. 27 on Map II.

Located on Beaver Creek, at Weaver; **Middle and Lower Kittanning Coals**; elevation, 1970′ B.

				Ft.	In.
1.	Slate, black				
2.	Coal, soft	0′	7″		
3.	Slate, black	0	5		
4.	Coal, soft	0	9		
5.	Slate, black	1	10		
6.	Coal, bony	1	4		
7.	Coal, soft	1	6		
8.	Fire clay, hard, sandy	0	5		
9.	Coal	0	7		
10.	Slate, black	0	2		
11.	Coal	3	8		
12.	Fire clay, gray	0	5		
13.	Coal, soft	1	3		
14.	Coal, bony, "knee deep"	1	1	14	0
15.	Slate, pavement				

"No butts or faces; greatest rise. southeast."

This mine had been almost all worked out when it was examined several years ago and the records of the State Department of Mines do not show that it now has production. A sample submitted by Mr. H. Hirsh from the files of the company shows the following analysis:

	Per cent.
Moisture	1.12
Volatile Matter	27.84
Fixed Carbon	60.05
Ash	12.11
Sulphur	1.26

Davis Coal & Coke Co., Weaver Mine No. 2—No. 28 on Map II.

On Beaver Creek, at Weaver; **Middle and Lower Kittanning Coals**; elevation, 1980′ B.

				Ft.	In.
1.	Slate, dark				
2.	**Coal**, medium-hard	2′	8″		
3.	Slate, dark, 2″ to	0	3		
4.	**Coal**, bony	0	8		
5.	Slate, dark	0	3		
6.	**Coal**, soft	3	3		
7.	Slate, dark	0	4		
8.	**Coal**, good, soft	1	3		
9.	**Coal**, bony, "knee deep"	1	0	9	8
10.	Slate, pavement				

"No butts or faces; greatest rise, southeast; coal shipped east for steam fuel."

A sample collected from Weaver, and apparently from this opening, by A. P. Brady, and previously published in Volume II(A), page 512, under the name of **Maryland Smokeless Coal Company**, is repeated under **Mine No. 28** in the Table of Coal Analyses at the end of this Chapter. A sample of coke from this mine, collected by Mr. Brady, shows the following analysis according to B. H. Hite, former Chemist of the Survey:

	Per cent.
Moisture	0.23
Volatile Matter	1.10
Fixed Carbon	82.25
Ash	16.42
Total	100.00
Sulphur	1.24
Phosphorus	0.021

A sample of coal from this mine, submitted by Mr. Hirsh, shows the following:

	Per cent.
Moisture	1.18
Volatile Matter	29.29
Fixed Carbon	59.76
Ash	10.95
Sulphur	1.77

The following mine was once operated by **W. H. Green**, but was later acquired by the Davis Coal and Coke Company:

Davis Coal and Coke Co., Williette Mine—No. 29 on Map II.

On Beaver Creek, 0.5 mile northeast of Weaver; **Middle and Lower Kittanning Coals**; elevation, 2000′ B.

				Ft.	In.
1.	Slate				
2.	**Coal**	2′	8½″		
3.	Bone	0	5		
4.	**Coal**	2	2	5	3½
5.	Slate, pavement				

"Greatest rise, southeast; sample collected from Nos. 2 and 4 of section, in Room No. 1, off First Right, by D. D. Teets, Jr."

The composition of this sample is published under **Mine No. 29** in the Table of Coal Analyses at the end of this Chapter.

The Davis Colliery Company formerly operated a large mining establishment at Harding, consisting of five openings delivering coal to the same tipple, and including 85 beehive coke ovens, but for several years this plant has been the property of the West Virginia Coal and Coke Company. Measurements made at the various openings show the following:

Davis Colliery Company, Harding Mine (No. 2 Opening) (Now West Virginia Coal and Coke Company No. 3)—No. 30 on Map II.

On a branch of Tygart River, 0.3 mile north of Harding; **Middle and Lower Kittanning Coals**; elevation, 1965′ B.

				Ft.	In.
1.	Shale				
2.	**Coal, soft**	3′	10″		
3.	Slate, gray	0	6		
4.	**Coal, soft**	1	10		
5.	Slate, bony	0	11		
6.	**Coal, bony**	1	2	8	3
7.	Slate, pavement				

Davis Colliery Company, Harding Mine (No. 3 Opening) (Now West Virginia Coal and Coke Company No. 3)—No. 31 on Map II.

On a branch of Tygart River, 0.6 mile northeast of Harding; **Middle and Lower Kittanning Coals**; elevation, 1965′ B.

				Ft.	In.
1.	Slate, dark				
2.	**Coal, soft**	3′	2″		
3.	Slate, dark	0	7		
4.	**Coal, harder**	1	5		
5.	**Coal, bony**	0	9	5	11
6.	Slate, pavement				

Davis Colliery Company, Harding Mine (No. 4 Opening) (Now West Virginia Coal and Coke Company No. 3)—No. 32 on Map II.

On a branch of Tygart River, 0.9 mile northeast of Harding; Middle and Lower Kittanning Coals; elevation, 1990' B.

				Ft.	In.
1.	Slate				
2.	Coal	3'	7"		
3.	Slate	0	4		
4.	Coal	1	8	5	7
5.	Slate				

"Butts, N. 89° E.; faces, N. 1° W.; greatest rise, southeast; sample collected from Nos. 2 and 4 of section by D. D. Teets, Jr."

The composition of this sample is published under Mine No. 32 in the Table of Coal Analyses at the end of this Chapter. A sample of coke, taken from the cars in the yard by Teets, shows the following analysis:

	Per cent.
Moisure	0.15
Volatile Matter	2.52
Fixed Carbon	82.13
Ash	15.20
Total	100.00
Sulphur	1.09
Phosphorus	0.018

Davis Colliery Company, Harding Mine (No. 5 Opening) (Now West Virginia Coal and Coke Company No. 3)—No. 33 on Map II.

On a branch of Tygart River, 0.9 mile northeast of Harding; Middle and Lower Kittanning Coals; elevation, 2045' B.

				Ft.	In.
1.	Shale, sandy				
2.	Coal	1'	0"		
3.	Slate	2	0		
4.	Coal, soft	3	0		
5.	Slate	0	4		
6.	Coal, soft	3	5		
7.	Slate, dark	0	6		
8.	Coal, soft	1	3		
9.	Coal, bony	0	11	12	5
10.	Slate, pavement				

The section as above given reveals the full thickness of the coals as they occur in this vicinity, Nos. 6 to 9, inclusive, being the portion usually mined.

Davis Colliery Company, Harding Mine (No. 1 Opening) (Now West Virginia Coal and Coke Company No. 3)—No. 34 on Map II.

On a branch of Tygart River, 0.6 mile northeast of Harding; Middle and Lower Kittanning Coals; elevation, 1995' B.

				Ft.	In.
1.	Slate, black, with a few streaks of coal				
2.	Coal, soft	3'	8"		
3.	Slate, dark	0	4		
4.	Coal, soft	3	7		
5.	Slate, dark	0	5		
6.	Coal, soft	1	2		
7.	Coal, bony	0	8	9	10
8.	Slate, pavement				

A section measured at the fan-house shows the following:

Davis Colliery Company, Harding Mine (Fan-House Opening) (Now West Virginia Coal and Coke Company No. 3)—No. 35 on Map II.

On a branch of Tygart River, 0.6 mile northeast of Harding; Middle and Lower Kittanning Coals; elevation, 2000' B.

				Ft.	In.
1.	Shale, sandy,				
2.	Coal	0'	8"		
3.	Slate, dark	0	4		
4.	Coal	0	4		
5.	Slate, dark, soft	1	9		
6.	Coal, soft	3	10		
7.	Slate, dark, hard	0	4		
8.	Coal, soft	3	6		
9.	Slate, dark	0	4		
10.	Coal, soft	1	6		
11.	Coal, bony	1	0	13	7
12.	Slate, pavement				

A section measured at an air-hole toward the eastern edge of this group of mines shows the following:

Davis Colliery Company, Harding Mine (Air-Hole of No. 1 Opening) (Now West Virginia Coal and Coke Company No. 3)—No. 36 on Map II.

On a branch of Tygart River, 1.2 miles northeast of Harding; Middle and Lower Kittanning Coals; elevation, 2155' B.

				Ft.	In.
1.	Shale, sandy				
2.	Slate, dark, cannelly			1	4
3.	Shale, dark			1	6
4.	Coal	0'	11"		
5.	Slate, dark	0	1		
6.	Coal, soft	2	6		
7.	Bone, 1" to	0	3		
8.	Coal, soft	3	6		
9.	Slate, dark	0	2		
10.	Coal, soft	1	10	9	3
11.	Slate, pavement				

A former measurement made at the Harding Mine by A. P. Brady is published in Volume II(A), pages 510-511, together with analyses of the coal and coke from the same, under the name of Junior Coal Company. Information is not available to show which opening Mr. Brady visited.

The following table of coke analyses from the Harding Mines was furnished Teets over the signature of E. H. May, Chemist:

Sample No.	2865	2866	2867	2868	2869	2870
Moisture	0.30	0.10	0.30	0.10	0.60	0.20
Volatile Matter	0.91	0.98	1.30	1.25	1.40	1.30
Fixed Carbon	86.79	84.12	84.65	84.45	83.60	83.80
Ash	12.00	14.80	13.75	14.20	14.40	14.70
Totals	100.00	100.00	100.00	100.00	100.00	100.00
Sulphur	1.30	1.22	1.38	1.30	1.53	1.24

Samples Nos. 2865-2869, inclusive, 48-hour foundry coke.
Sample No. 2870, 72-hour foundry coke.

Quantity of Middle and Lower Kittanning Coals Available

The following table shows the probable amount of Middle and Lower Kittanning Coals originally available in the various magisterial districts before mining began, as measured by Tucker with planimeter according to the areas outlined for them on Map II and Figure 18. The estimated thickness includes the total to be derived from both the Middle and Lower Kittanning, whether occurring as one large bed or as two separate seams:

Probable Amount of Middle and Lower Kittanning Coals.

Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal. (2000 lbs.)
Roaring Creek	6	23.90	15,296	3,997,762,560	159,910,502
Middle Fork	5	1.95	1,248	271,814,400	10,872,576
Leadsville	6	3.35	2,144	560,355,840	22,414,234
Totals		29.20	18,688	4,829,932,800	193,197,312

At the end of the calendar year 1928 approximately 17,726,243 short tons of Middle and Lower Kittanning (including a little Clarion) had been mined in the county, or approximately 9 per cent. of the estimated tonnage. Allowing for losses in mining there remains approximately 174,000,000 tons of Middle and Lower Kittanning Coal.

CLARION COAL.

The Clarion Coal, sometimes occurring 20 to 30 feet below the Lower Kittanning, is found in northwestern Randolph County along Tygart River and to the southward, as previously discussed in Chapter VI, page 231, but in the Laneville country of the northeastern corner of the county it apparently is too thin to have economic importance. Its outcrop is shown on Map II for the western area, and Figure 19 shows its supposed minable extent. It is a multiple-bedded seam, varying in thickness from one to 10 feet, a considerable portion of the latter thickness being slate whenever it thickens to such proportions. It has been mined at a few localities but always to great disadvantage, owing to the slate that must be removed.

Clarion Coal, Roaring Creek District.

In Roaring Creek District the Clarion was observed at a few points, being often too thin and slaty to be of much value. It was once mined commercially at Leiter, but the place was abandoned owing to the large amount of slate. A measurement made by Teets at this old mine shows the following:

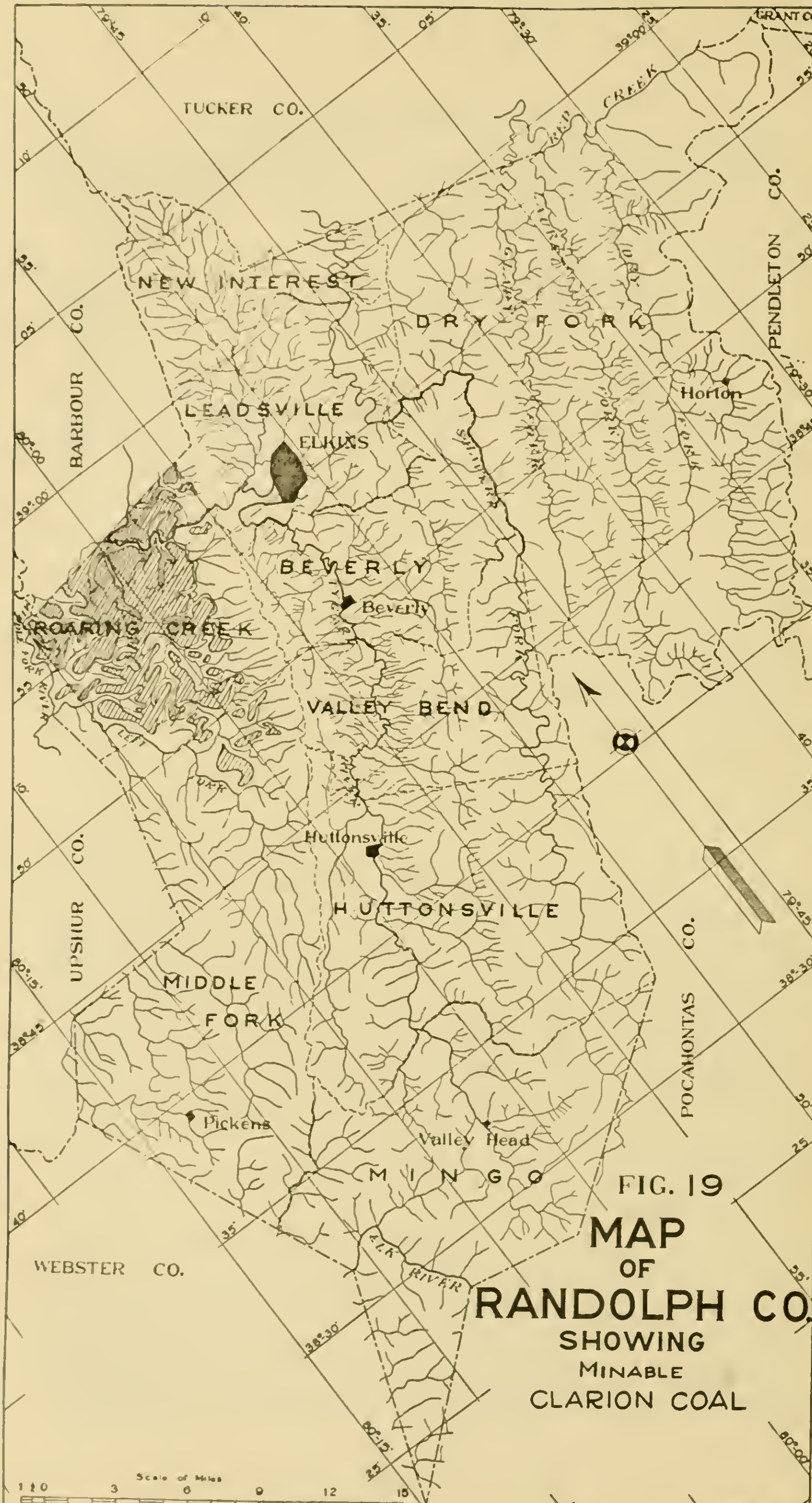


FIG. 19

MAP OF RANDOLPH CO. SHOWING MINABLE CLARION COAL

Davis Coal and Coke Company, Leiter Mine (Abandoned)—No. 37 on Map II.

On Tygart River, 0.3 mile south of Leiter; **Clarion Coal**; elevation, 2025′ B.

				Ft.	In.
1.	Shale				
2.	Coal, croppy	1′	6″		
3.	Slate, black	0	10		
4.	Coal	1	2		
5.	Slate, bony	0	8		
6.	Coal	0	1		
7.	Slate, dark	0	9		
8.	Coal	2	8		
9.	Shale, gray	0	10		
10.	Coal, soft, visible	1	3	9	9

A sample was once collected from this mine and published in Bulletin 2, page 300, of the Survey, under the name of **Maryland Smokeless Coal Company.** It is republished under **Mine No. 37** in the Table of Coal Analyses at the end of this Chapter.

The coal is exposed at several points along the Coal and Coke Railway grade west of Leiter, usually occurring from 10 to 20 feet below the Lower Kittanning. At the **Coal and Coke Railway Exposure (No. 38 on Map II)**, on Little Laurel Run of Tygart River 0.8 mile northwest of Loop Station, the coal varies from one to three feet, its elevation being 2080′ B. At the **Coal and Coke Railway Exposure (No. 39 on Map II)**, on Little Laurel Run one mile northwest of Loop Station, the coal is 2′ 0″ thick at elevation 2015′ B. At the **Coal and Coke Railway Exposure (No. 40 on Map II)**, on the same run one mile northwest of Loop Station, it is four feet thick at elevation 2135′ B. The following exposure shows its relationship to the Lower Kittanning:

Coal and Coke Railway Exposure—No. 41 on Map II.

On Little Laurel Run, 1 mile west of Loop Station; **Clarion Coal**; elevation, 2144′ B.

		Ft.	In.
1.	Sandstone, massive, Upper East Lynn	10	0
2.	Coal, Lower Kittanning, (2150′ B.), 6′ to	7	0
3.	Shale, sandy and dark	5	0
4.	Coal, Clarion (2144′ B.)	1	0
5.	Shale, dark and sandy, to grade	10	0

Clarion Coal, Leadsville District.

In Leadsville District the following prospect shows the Clarion at its maximum development, indicating the numerous slate partings:

Davis Coal and Coke Company Prospect—No. 42 on Map II.

On Beaver Creek, at Weaver; Clarion Coal; elevation, 1970' B.

				Ft.	In.
1.	Sandstone, Kittanning, somewhat flaggy, grayish-white, visible			20	0
2.	Coal, soft	2'	0"		
3.	Coal, bony	0	5		
4.	Fire clay, sandy, dark-gray	1	7		
5.	Coal, cannel, partly bone	0	6		
6.	Fire clay, dark-gray, soft	1	0		
7.	Coal, good	1	9		
8.	Fire clay, grayish-white, 2" to	0	4		
9.	Coal, bony, with streaks of slate in center	0	5		
10.	Fire clay, dark-gray	0	11		
11.	Coal, soft	0	3		
12.	Fire clay, dark	0	8		
13.	Coal, soft, slaty	1	7	11	5
14.	Slate, pavement				

Quantity of Clarion Coal Available.

The following table, prepared by Tucker from a planimetric measurement of the outcrop on Map II, shows the probable amount of minable Clarion Coal by magisterial districts, due allowance being made for impurities:

Probable Amount of Clarion Coal.

Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal. (2000 lbs.)
Roaring Creek	2	25.00	16,000	1,393,920,000	55,756,800
Leadsville	5	5.00	3,200	696,960,000	27,878,400
Totals		30.00	19,200	2,090,880,000	83,635,200

MINABLE COALS, KANAWHA GROUP OF POTTSVILLE SERIES.

UPPER MERCER COAL.

The Upper Mercer Coal, previously discussed on page 241, of Chapter VI, and shown by outcrop lines on Map

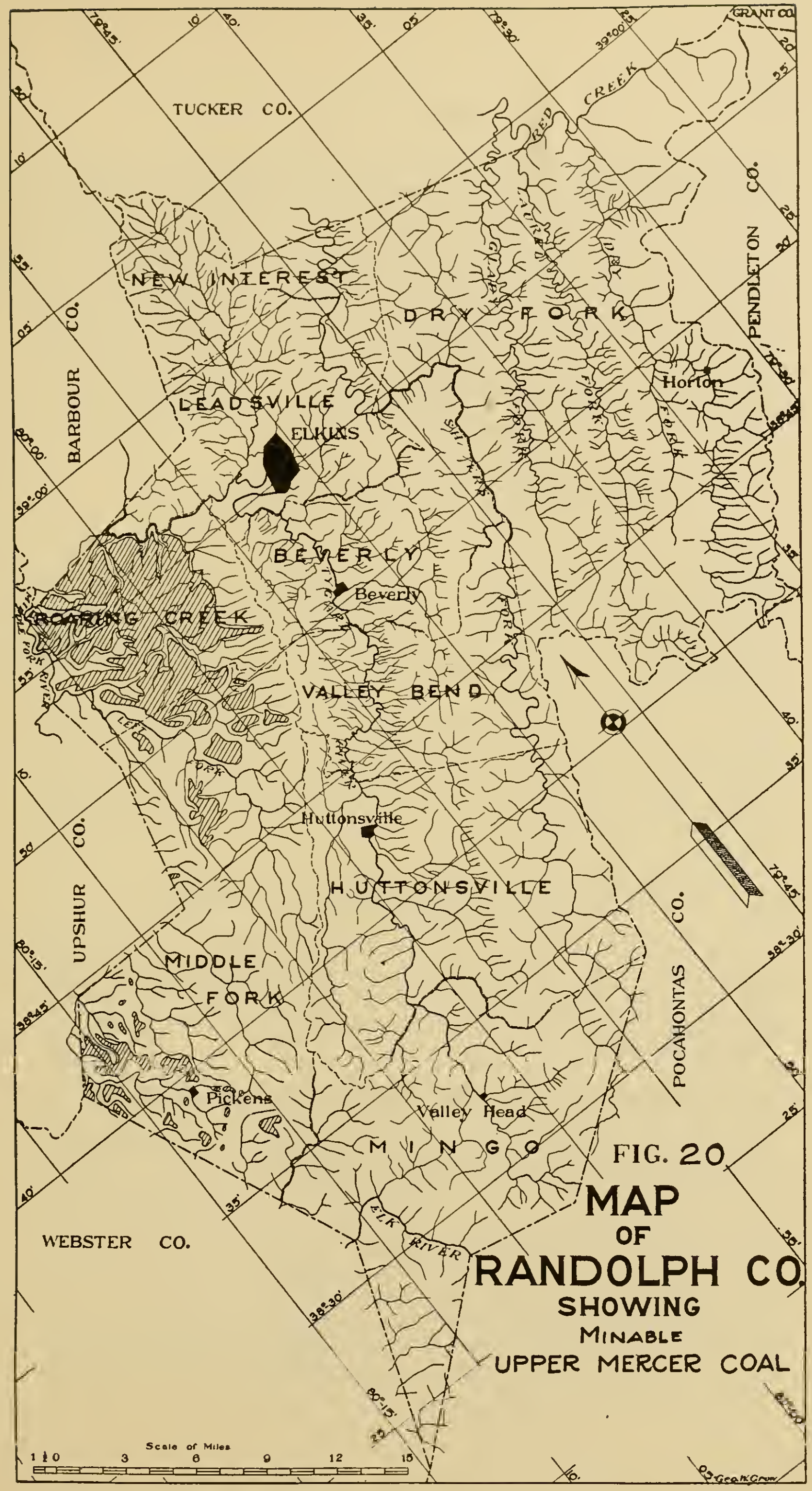


FIG. 20

MAP OF RANDOLPH CO. SHOWING MINABLE UPPER MERCER COAL

II for those areas where it has possible minable thickness, is of principal value in the western part of the county. In the Laneville country along the Stony River Basin it is apparently too thin for possible mining. This coal, like the Clarion, is patchy and uncertain, often containing too much slate and bone to permit of successful mining and frequently being absent entirely from the measures. It is often a thick coal, however, with two or three benches of good clean fuel, and has furnished a considerable amount of domestic coal. Figure 20 shows the territory in which it may prove to be commercially minable at some localities.

Upper Mercer Coal, Roaring Creek District.

In Roaring Creek District only a few openings in the Upper Mercer were noted. At the **Coal and Coke Railway Exposure (No. 43 on Map II)**, on Tygart River 0.5 mile northwest of Leiter, the coal is visible in the railroad cut at elevation 1890' B., coming 20 feet below the great Homewood cliff and having a variable thickness of three to five feet, with partings.

The **Pat Ford Farm Mine (No. 44 on Map II)**, on Laurel Creek of Middle Fork River at the old "Half-Way House" 1.4 miles west of Pumpkintown, showed 5' 3" of coal and slate at elevation 2380' B., as exhibited in detail in the Pumpkintown Section, page 131.

Upper Mercer Coal, Middle Fork District.

The Upper Mercer Coal has been opened at a few points in Middle Fork District and in these it preserves its usual character, having alternate layers of coal and slate. The three following openings were noted by Teets on the waters of Middle Fork River:

Maxwell, Arnold, et al. Farm Mine—No. 45 on Map II.

On Cassity Fork of Middle Fork River, 2.8 miles northeast of Cassity; Upper Mercer Coal; elevation, 2535' B.

			Ft.	In.
1. Slate, cannel			1	4
2. Coal, soft	0'	9"		
3. Slate, black, 3" to	0	6		
4. Coal, soft	1	0		
5. Slate, gray	0	7		
6. Coal, soft, visible	1	0	3	10
7. Concealed by water				

A sample was collected from this opening the composition of which is published under **Mine No. 45** in the Table of Coal Analyses at the end of this Chapter.

Moore-Keppel & Company Farm Mine—No. 46 on Map II.

On a branch of Cassity Fork, 1.2 miles southeast of Cassity; Upper Mercer Coal; elevation, 2630′ B.

				Ft.	In.
1.	Slate, cannel				
2.	Coal, bony	0′	9″		
3.	Slate, black	0	10		
4.	Coal	0	8		
5.	Shale, gray	0	7		
6.	Coal	1	10		
7.	Coal, reported	0	8	5	4

A sample was collected from this opening, the composition of which is published under **Mine No. 46** in the Table of Coal Analyses at the end of this Chapter.

The **Taylor George Prospect (No. 47 on Map II)**, on Panther Run, 2.1 miles southeast of Cassity, at elevation 2640′ B., had fallen shut and could not be measured.

On the waters of Buckhannon River, several openings have been made. The **Ernest Pouli Farm Mine (No. 48 on Map II)**, on Left Fork of Right Fork, 0.7 mile northwest of Helvetia, at elevation 2730′ B., had fallen shut, but was reported 3 to 4 feet thick. The **J. A. McCauley Farm Mine (No. 49 on Map II)**, located on Right Fork of Buckhannon River, 0.4 mile north of Silica, at elevation 2750′ B., measured 3′ 4″ of clean, soft coal, as shown by the Silica Section, page 143, its position being 3 feet below the great Homewood cliff. **Coal Prospect No. 50 on Map II**, on Right Fork of Buckhannon River, 0.7 mile east of Silica, at elevation 2920′ B., had fallen shut, its position being apparently just below the Homewood cliff. The **John McCauley Farm Mine (No. 51 on Map II)**, on the south side of Right Fork of Buckhannon River, 0.6 mile southwest of Silica, at elevation 2795′ B., had fallen shut, its thickness being reported as 6 feet. The **Andrew Balli Farm Mine (No. 52 on Map II)**, on Devil Fork of Buckhannon River, 2.5 miles northwest of Pickens, at elevation 2965′ B., had been abandoned, but, according to Mr. Balli, showed about 3 feet of coal. The coal was once opened in the top of Turkeybone Mountain, at the head of a branch of Right Fork of Buckhannon River, 1.8 miles southeast of Pickens, at the **James Pickens Heirs Prospect (No. 53 on Map II)**, at elevation 3670′ B., and coming just below the massive, pebbly Homewood Sandstone which caps the knob.

The thickness of the coal at this point was not learned. Southwestward from the knob last mentioned, the Homewood Sandstone appears in two or three other sharp points and in one of these the coal was opened by L. M. and John Hull on what is now the Robert Hull land. The opening had fallen shut, the following section being reported by L. M. Hull:

Robert Hull Farm Mine—No. 54 on Map II.

On Bee Knob, at the head of Right Fork of Buckhannon River, 2.7 miles south of Pickens; Upper Mercer Coal; elevation, 3530' B.

			Ft.	In.
1. Coal, thickness unknown				
2. Shale, gray	2'	0"		
3. Coal	2	0	4	0

The great, coarse, massive Homewood ledge caps the knob immediately above this opening.

Quantity of Upper Mercer Coal Available.

The following table shows the probable amount of minable Upper Mercer Coal by magisterial districts, as figured from a planimetric measurement by Tucker of the areas indicated on Map II and Figure 20, due allowance being made for impurities and for localities where the coal is too thin for mining:

Probable Amount of Upper Mercer Coal.

Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal. (2000 lbs.)
Roaring Creek	3	38.00	24,320	3,178,137,600	127,125,504
Middle Fork	3	11.50	7,360	961,804,800	38,472,192
Totals	--	49.50	31,680	4,139,942,400	165,597,696

LOWER MERCER (STOCKTON) COAL.

The Lower Mercer Coal of Pennsylvania, believed to be the Stockton of the Great Kanawha Valley of West Virginia, has been previously discussed in Chapter VI, page 242.

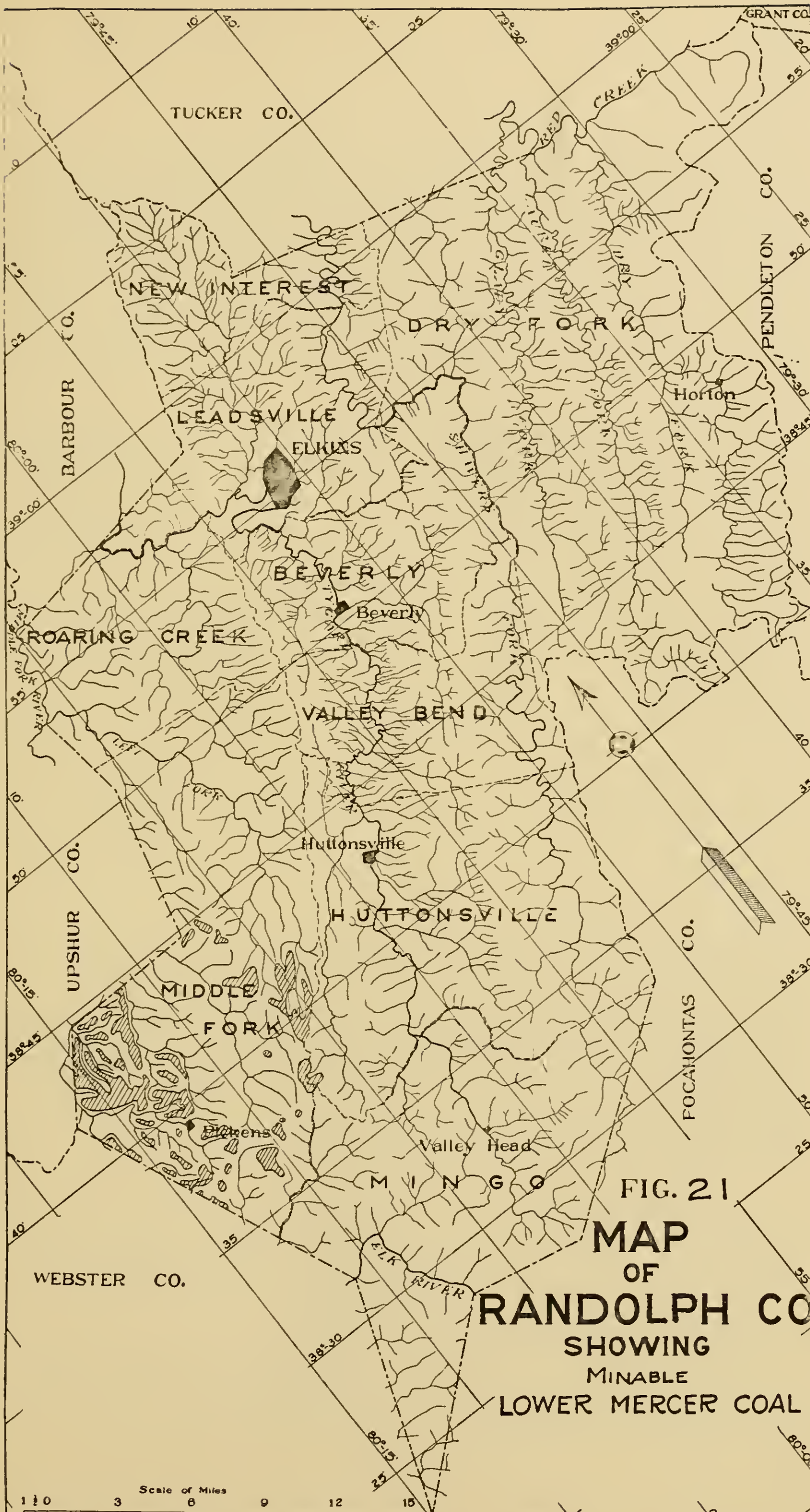


FIG. 21

MAP OF RANDOLPH CO SHOWING MINABLE LOWER MERCER COAL

In Randolph County it has minable thickness principally in the western portion of Middle Fork District, thinning out toward the north and being apparently worthless in the Stony River Basin near Laneville. At its best localities it is a good pure coal, about four feet thick, having hard, splinty layers, similar to the coals of the Great Kanawha Valley, and is mined for local domestic use with satisfactory results. Its outcrop is delineated on Map II for its probable mining area and Figure 21 shows at a glance the extent of this territory.

Lower Mercer (Stockton) Coal, Roaring Creek District.

In Roaring Creek District the Lower Mercer (Stockton) Coal was not observed in minable thickness but the Findley Section, page 128, records it as two feet thick, coming just above the Upper Connoquenessing Sandstone. It also appears in a few of the Coal and Coke Railway cuts west of Leiter, the following section being one of these exposures:

Coal and Coke Railway Exposure—No. 55 on Map II.

On Laurel Run of Tygart River, 0.4 mile southeast of Findley; Lower Mercer (Stockton) Coal; elevation, 1950′ B.

				Ft.	In.
1.	Sandstone, massive				
2.	Slate, black			7	0
3.	Coal, bony	0′	11″		
4.	Slate, black	1	0		
5.	Coal	1	0	2	11
6.	Shale, to grade				

Lower Mercer (Stockton) Coal, Middle Fork District.

Several exposures of the Lower Mercer (Stockton) were noted in the northwestern corner of Middle Fork District, on the waters of Buckhannon River. At Coal Exposure No. 56 on Map II, on the ridge west of Left Fork of Right Fork of Buckhannon, 1.1 miles north of Helvetia, Teets noted 1′ 8″ of coal in the public road at elevation 2635′ B.

R. T. Evans Farm Mine—No. 57 on Map II.

On a branch of Marsh Fork of Buckhannon River, 1.3 miles southwest of Silica; Lower Mercer (Stockton) Coal; elevation, 2880′ B.

				Ft.	In.
1.	Slate, dark				
2.	Coal, splinty	2′	2″		
3.	Coal, softer	0	10	3	0
4.	Slate, pavement				

Andrew Balli Farm Mine—No. 58 on Map II.

On Devil Fork of Buckhannon River, 1.8 miles southwest of Silica; Lower Mercer (Stockton) Coal; elevation, 2890' B.

				Ft.	In.
1.	Shale, dark				
2.	Coal, splint	2'	2"		
3.	Coal, softer	0	9	2	11
4.	Slate, pavement				

A sample was collected from Nos. 2 and 3 of section, the composition of which is published under Mine No. 58 in the Table of Coal Analyses at the end of this Chapter.

The following opening is reported by Teets on Little Sugar Creek tributary to the Elk River drainage system:

Bird Casto Farm Mine—No. 59 on Map II.

On Little Sugar Creek, 2.3 miles southwest of Pickens; Lower Mercer (Stockton) Coal; elevation, 3330' B.

				Ft.	In.
1.	Slate, black				
2.	Coal	0'	11"		
3.	Slate, gray	0	10		
4.	Coal	0	6		
5.	Slate, or bony coal	0	3		
6.	Coal	1	1		
7.	Slate	0	1		
8.	Coal	0	2	3	10
9.	Slate, pavement				

Quantity of Lower Mercer (Stockton) Coal Available.

The following table shows the probable amount of Lower Mercer (Stockton) Coal available for mining, the areal extent having been measured with planimeter by Tucker according to the areas outlined on Map II and Figure 21:

Probable Amount of Lower Mercer (Stockton) Coal.

Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal. (2000 lbs.)
Middle Fork	3	10.30	6,592	861,442,560	34,457,702

QUAKERTOWN (WINIFREDE?) COAL.

The Quakertown (Winifrede?) Coal, previously discussed in Chapter VI, page 245, and shown by outcrop lines on Map II in the areas where it may eventually be mined, appears to have some value in a limited portion of the western edge of the county. In this territory it seldom exceeds two feet in thickness, being sometimes represented only by a blossom, but at localities where it thickens to possible usefulness it is usually good, soft coal. Figure 22 shows the area where it is best developed.

Quakertown (Winifrede?) Coal, Roaring Creek District.

In Roaring Creek District the Quakertown is not of much value but it was noted at the **James Ford Mine (No. 60 on Map II)**, on Laurel Creek of Middle Fork River one mile west of Pumpkintown at elevation 2270′ B. This opening had fallen shut and the thickness was not reported.

Quakertown (Winifrede?) Coal, Middle Fork District,

In Middle Fork District the Quakertown Coal has been noted in the Lick Run of Middle Fork Section, page 132, only the blossom being exposed; in the Cassity Section, page 133, where it was reported only 0′ 8″ thick; and in the Cassity Fork Section, page 135, where only the blossom is exposed. It is reported by Teets at **Coal Exposure No. 61 on Map II**, on Crislip Run of Buckhannon River, 1.6 miles southeast of Newlonton, having an elevation of 2500′ B., and a thickness of 1′ 8″, as visible along the public road. At **Coal Prospect No. 62** on Map II, on Hooker Run of Buckhannon River, 0.4 mile north of Fairview, it was once opened at elevation 2705′ B., but the place had fallen shut and could not be measured. The following opening is somewhat isolated from the other mines of the Quakertown, but, according to Teets, it comes 110 feet below the top of the Upper Connoquenessing Sandstone, making it correlate with the Quakertown:

Elias Zickefoose Farm Mine—No. 63 on Map II.

On Birch Fork of Left Fork of Middle Fork River, 1.4 miles northwest of Adolph; Quakertown Coal; elevation, 2910′ B.

				Ft.	In.
1.	Slate, cannel				
2.	Coal	1′	0″		
3.	Slate, black	0	3		
4.	Coal	1	9	3	0
5.	Slate, pavement				

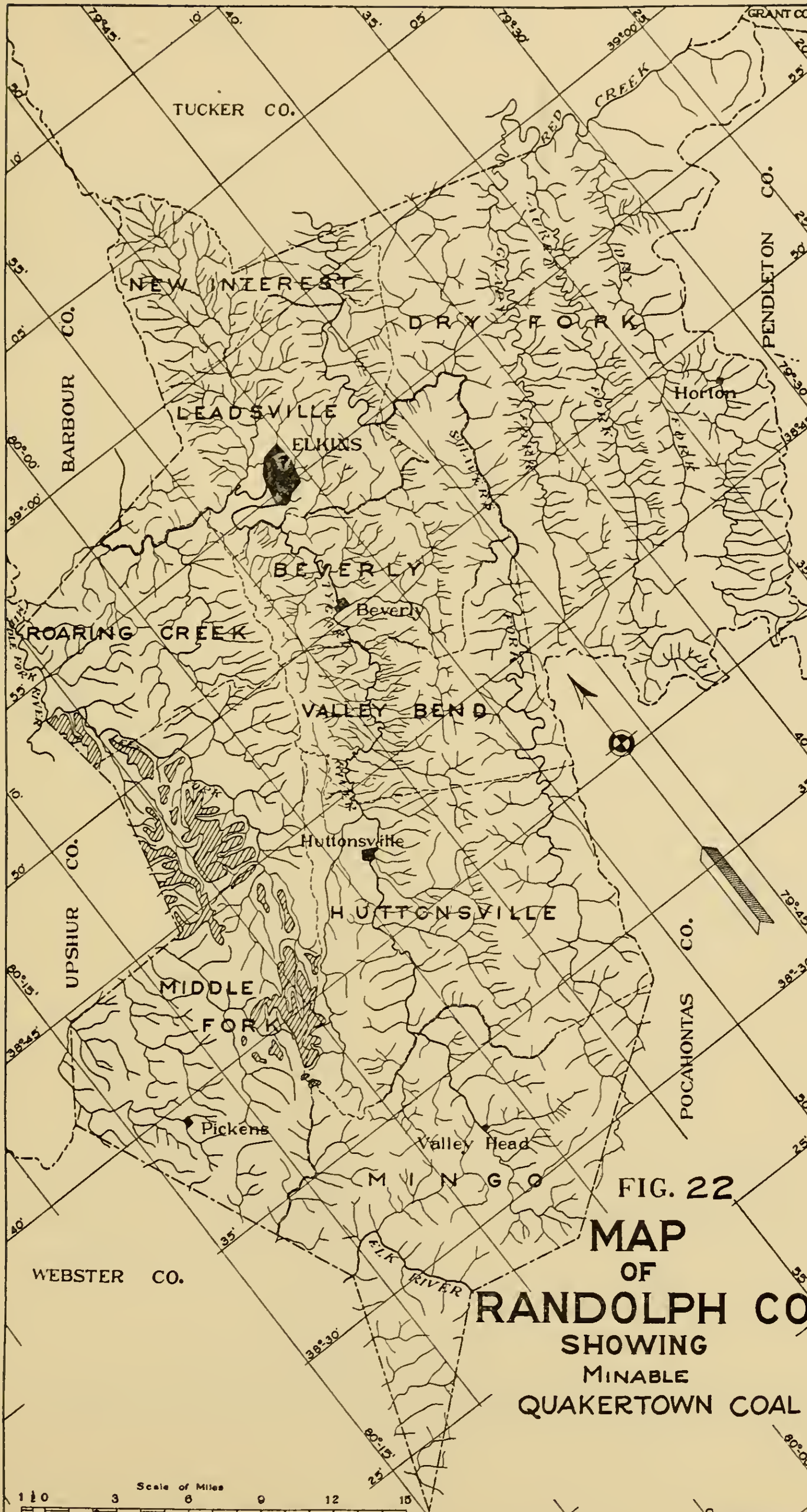


FIG. 22
MAP OF RANDOLPH CO. SHOWING MINABLE QUAKERTOWN COAL

Quakertown (Winifrede?) Coal, Leadsville District.

In Leadsville District the Quakertown appears to be entirely too thin for mining. In the Gage Section, page 147, it is only 0′ 4″ thick; and in the Laurel Section, page 148, it is only 0′ 6″. At **Coal Exposure No. 64 on Map II,** on Tygart River 0.3 mile south of Laurel it is visible in the railroad cut, being only 0′ 6″ thick, with an elevation of 1780′ B.

Quakertown (Winifrede?) Coal, Dry Fork District.

In the remainder of Randolph County the Quakertown was not noted as more than a blossom but in the Otter Creek Section, page 196, it is recorded as two feet thick at the **Otter Creek Boom and Lumber Company Exposure (No. 65 on Map II),** on Coal Run of Otter Creek, Dry Fork District, Tucker County, 1.5 miles south of Otter Station at elevation 2984′ B. Here it is 2′ 0″ thick, with an 8″ streak of slate near the bottom. There does not seem to be any possibility of finding minable coal at its horizon in the North Potomac (Georges Creek) and Stony River Basins.

Quantity of Quakertown (Winifrede?) Coal Available.

The following table shows the probable amount of Quakertown (Winifrede?) Coal by magisterial districts, as measured with planimeter by Tucker according to the regions outlined for it on Map II and Figure 22:

Probable Amount of Quakertown (Winifrede?) Coal.

Districts	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal. (2000 lbs.)
Roaring Creek	2	1.50	960	83,635,200	3,345,408
Middle Fork	2	13.60	8,704	758,292,480	30,331,699
Huttonsville	2	0.85	544	47,393,280	1,895,731
Totals		15.95	10,208	889,320,960	35,572,838

CAMPBELL CREEK (PEERLESS) COAL.

The Campbell Creek (Peerless) Coal, previously discussed in Chapter VI, page 250, and shown by outcrop

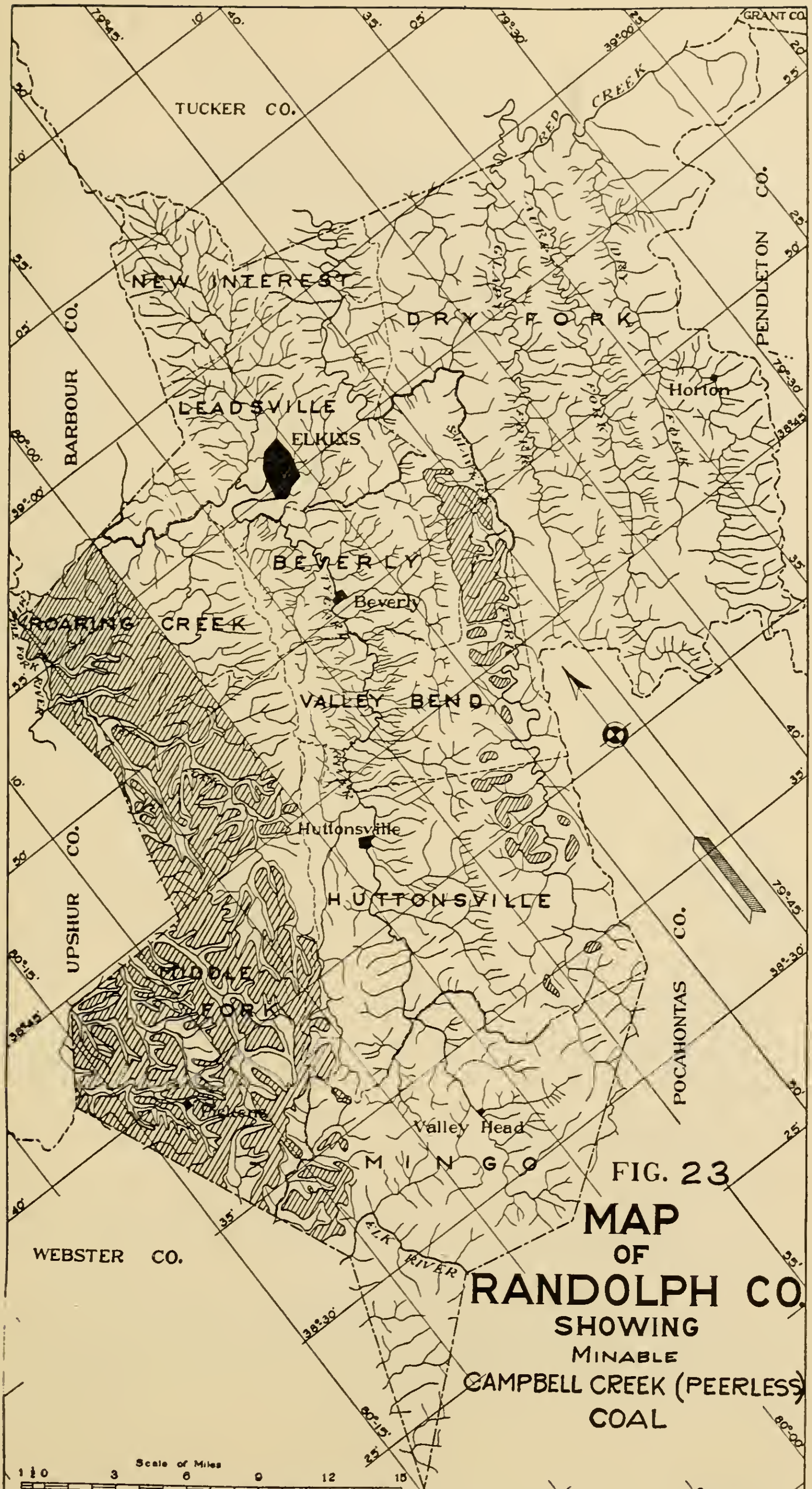


FIG. 23

MAP
OF
RANDOLPH CO.
SHOWING
MINABLE
CAMPBELL CREEK (PEERLESS)
COAL

on Map II for those localities where it is regarded as of value, has minable thickness in a considerable portion of the western part of the county and also in portions of the North Potomac (Georges Creek) Syncline in the valley of Shavers Fork. It is never so very thick but it is generally a pure, soft coal and has been extensively used for local domestic fuel. As previously stated, this coal was classified as the No. 2 Gas Bench of the Campbell Creek in the former Report on part of Randolph County but additional study through the central counties rather positively proves it to be the Peerless Bench instead, and hence it is so termed in the present Report. Figure 23 shows its minable area.

Campbell Creek (Peerless) Coal, Roaring Creek District.

In Roaring Creek District the Campbell Creek (Peerless) Coal is recorded in the Norton Section, page 129, as 0′ 7″ thick; and in the Pumpkintown Section, page 131, as 2′ 0″ thick. In the P. J. Cain No. 1 (13) Coal Test Boring, page 462, it is 1′ 5″ thick; and in the Maxwell and Crawford No. 3 (3) Coal Test Boring, page 460, it is 0′ 8″ thick. At the Shelton Reger (Alex Hart) Prospect (No. 74 on Map II), on the south side of Laurel Run of Roaring Creek 1.2 miles southeast of Fisher, what appears to be this coal was opened at elevation 2510′ B. but showed only 0′ 10″ of coal.

Several openings have been made on the waters of Middle Fork River and the coal has been used for local domestic fuel with results that are entirely satisfactory. The following prospect was examined by Teets in the edge of Washington District, Upshur County, just across the line from Randolph County:

Moore-Keppel & Company Prospect—No. 75 on Map II.

Washington District, Upshur County; on Middle Fork River, 0.5 mile south of Ellamore; Campbell Creek (Peerless) Coal; elevation, 1840′ B.

	Ft.	In.
1. Sandstone, massive		
2. Coal	2	6
3. Slate		

A sample was collected from this opening, the composition of which is published under Mine No. 75 in the Table of Coal Analyses at the end of this Chapter.

The Moore-Keppel & Company Farm Mine (No. 76 on Map II), on Middle Fork River at the south edge of Ellamore, is reported by Teets as measuring 2′ 4″ of clean coal, with an elevation of 1840′ B.

A few openings have been made on Laurel Creek. The **Emmet Connor Farm Mine (No. 77 on Map II)**, located 1.5 miles southeast of Ellamore, measured 2′ 0″ of clean coal at elevation 1955′ B. The **Peter Stanton Farm Mine (No. 78 on Map II)**, located two miles southeast of Ellamore, showed 2′ 3″ of clean coal at elevation 1990′ B. The coal was once opened at the **Rafferty Farm Mine (No. 79 on Map II)**, located 2.5 miles southeast of Ellamore at elevation 2035′ B., but its thickness was not obtained. All of these openings along Laurel Creek are only a few feet above drainage and the coal goes under a short distance east of the old Rafferty mine.

The coal is visible along Middle Fork River opposite Gale at the **Moore-Keppel & Company Railroad Exposure (No. 80 on Map II)**, having a total thickness of 3′ 1″, at elevation 1870′ B., with 0′ 8″ of bony coal at the middle. It was once opened at **Farm Mine No. 81 on Map II**, on Left Fork of Middle Fork River 0.4 mile southeast of Gale at elevation 1955′ B., but the place had been abandoned and could not be measured. The four following mines are in the same region:

William Hornbeck Farm Mine—No. 82 on Map II.

On Left Fork of Middle Fork River, 0.8 mile southeast of Gale; **Campbell Creek (Peerless) Coal**; elevation, 1910′ B.

			Ft.	In.
1. Sandstone, massive, visible				
2. **Coal**, soft	1′	0″		
3. **Coal**, bony	0	6		
4. **Coal**, soft	1	0	2	6
5. Slate, pavement				

The **William Tallman Farm Mine (No. 83 on Map II)**, on Left Fork of Middle Fork River 1.1 miles southeast of Gale, at elevation 1970′ B., had fallen shut but the seam was reported by Mr. Tallman as having measured slightly more than 2′ 6″ of clean coal. The two following openings were examined by Teets:

Thomas Rowan Farm Mine—No. 84 on Map II.

On a branch of Left Fork of Middle Fork River, 1.5 miles southeast of Gale; **Campbell Creek (Peerless) Coal**; elevation, 1985′ B.

			Ft.	In.
1. Slate				
2. **Coal**, soft	1′	0″		
3. **Coal**, bony	0	2		
4. **Coal**, soft	1	4	2	6
5. Slate, pavement				

William Hornbeck Farm Mine—No. 85 on Map II.

On Kettle Run, 2.2 miles southeast of Gale; Campbell Creek (Peerless) Coal; elevation, 2020′ B.

				Ft.	In.
1.	Slate				
2.	Coal, soft	1′	1″		
3.	Coal, bony	0	2		
4.	Coal, soft	1	6	2	9

A sample was collected from this opening, the composition of which is published under Mine No. 85 in the Table of Coal Analyses at the end of this Chapter.

Campbell Creek (Peerless) Coal, Middle Fork District.

In Middle Fork District the Campbell Creek (Peerless) Coal has been opened extensively for local use and furnishes a fine grade of fuel. In the Cassity Fork Boom & Lumber Company No. 1 (16) Coal Test Boring it is 2′ 4″ thick and in the No. 2 (17) of the same company it is 3′ 3″ thick, as published in this Chapter. The Koon Heirs Prospect (No. 86 on Map II), on Long Run 1.3 miles northwest of Long at elevation 2295′ B., had fallen shut and its thickness was not learned. The five following openings are reported by Teets:

Johnson Lower Farm Mine—No. 87 on Map II.

On Jenks Fork of Right Fork of Middle Fork River, 2.1 miles northeast of Hemlock; Campbell Creek (Peerless) Coal; elevation, 2790′ B.

				Ft.	In.
1.	Shale, sandy, roof				
2.	Coal, soft	1′	9″		
3.	Coal, bony	0	6		
4.	Coal, soft	1	0	3	3
5.	Slate, pavement				

John Fincham Farm Mine—No. 88 on Map II.

On Left Fork of Middle Fork River, 1.6 miles north of Adolph; Campbell Creek (Peerless) Coal; elevation, 2453′ L.

		Ft.	In.
1.	Slate, gray, visible	8	0
2.	Coal, soft, glossy, columnar	2	6
3.	Slate, pavement		

A sample was collected from this opening, the composition of which is published under Mine No. 88 in the Table of Coal Analyses at the end of this Chapter.

Three very interesting chemical analyses of this coal, one of which includes a coke analysis, have been made by private parties, and have been furnished the Survey by Claude W. Maxwell, of Elkins, West Virginia, as follows:

Bethlehem Steel Co. Analysis of John Finchman Campbell Creek (Peerless) Coal; Laurel Branch, 150 feet from river; coal 36 inches thick.

	Per cent.
Volatile Matter	33.25
Fixed Carbon	64.16
Ash	2.59
Total	100.00
Sulphur	1.08

W. Va. Coal & Coke Co. analysis of same:

	Per cent.
Volatile Matter	33.25
Fixed Carbon	64.00
Ash	2.70
Total	99.95
Sulphur	0.90

Alan Wood Iron & Steel Co. analysis of car-load of same:

	Per cent.
Volatile Matter	30.83
Fixed Carbon	65.16
Ash	4.01
Total	100.00
Sulphur	1.29

Analysis of coke from this car:

	Per cent.
Volatile Matter	0.93
Fixed Carbon	92.30
Ash	6.77
Total	100.00
Sulphur	0.88

The **N. C. Bell Heirs Farm Mine (No. 89 on Map II)**, on Laurel Branch of Left Fork of Middle Fork, 1.6 miles northeast of Adolph, measured 2′ 7″ of clean, soft, columnar coal, at elevation 2475′ B.

Mr. Claude W. Maxwell, of Elkins, West Virginia, has also furnished the Survey the following interesting analysis of coal from the Bell mine on Laurel Branch as made by the H. Koppers Company, Pittsburgh, Pa.:

	Per cent.
Volatile Matter	29.12
Fixed Carbon	68.57
Ash	2.31
Total	100.00
Sulphur	0.93
Phosphorus	0.005
Cubic feet of gas per net ton at 15° C.	11,554

Farm Mine No. 90 on Map II, on the same branch, 1.9 miles northeast of Adolph, showed 2′ 4″ of clean coal at elevation 2560′ B.

The Ephraim McCauley Farm Mine (No. 91 on Map II), on the same branch, 2.5 miles northeast of Adolph, measured 1′ 10″ of clean coal at elevation 2615′ B.

The following opening is farther west on the opposite side of the Belington Syncline:

Ella Brake Farm Mine—No. 92 on Map II.

On Birch Fork of Left Fork of Middle Fork, 0.9 mile northeast of Blue Rock; Campbell Creek (Peerless) Coal; elevation, 2885′ B.

				Ft.	In.
1.	Slate, black			2	0
2.	Coal	1′	0″		
3.	Shale, dark	4	0		
4.	Coal, hard	0	5		
5.	Coal, soft, columnar	2	2	7	7
6.	Slate, pavement				

A sample was collected from No. 5 of section, the composition of which is published under Mine No. 92 in the Table of Coal Analyses at the end of this Chapter.

An attempt was made to open what appears to represent the Campbell Creek Coal at the Nicholas Loudin Prospect (No. 93 on Map II), on Birch Fork, 0.3 mile south of Blue Rock, at elevation 2975′ B., but here the thickness was reported as only 6 to 8 inches, the full height of the seam not being opened up.

Several openings have been made on the headwaters of Buckhannon River. The J. J. Wuerzer Farm Mine (No. 94 on Map II), on Trout Run, 1.3 miles northeast of Helvetia, at elevation 2760′ B., had fallen shut at the time of Teets' visit and could not be measured. The two following openings were examined by Teets in the same region:

M. N. Hicks Farm Mine—No. 95 on Map II.

On Saltblock Run, 0.8 mile northwest of Hartridge; Campbell Creek (Peerless) Coal; elevation, 3295' B.

				Ft.	In.
1.	Slate				
2.	Coal, soft	1'	11"		
3.	Coal, softer	0	9	2	8

Frank Hoover Farm Mine—No. 96 on Map II.

On Middle Fork of Right Fork of Buckhannon, 1.1 miles west of Helvetia; Campbell Creek (Peerless) Coal; elevation, 2455' B.

				Ft.	In.
1.	Slate				
2.	Coal, soft	1'	2"		
3.	Coal, bony	0	10		
4.	Coal, soft	1	3	3	3

The R. T. McCauley Farm Mine (No. 97 on Map II), on Right Fork of Buckhannon River, 0.4 mile northwest of Silica, measured 2' 2" of splinty coal, at elevation 2490' B.

Dr. J. L. Cunningham Prospect—No. 98 on Map II.

On Marsh Fork, 0.7 mile southeast of Silica; Campbell Creek (Peerless) Coal; elevation, 2545' B.

				Ft.	In.
1.	Slate				
2.	Coal	0'	7"		
3.	Slate, dark	0	8		
4.	Coal, splinty	1	5	2	8
5.	Slate, pavement				

Dr. J. L. Cunningham Prospect—No. 99 on Map II.

On Marsh Fork, 0.8 mile southwest of Silica; Campbell Creek (Peerless) Coal; elevation, 2550' B.

				Ft.	In.
1.	Slate, dark			5	0
2.	Coal	0'	6"		
3.	Slate, black	0	3		
4.	Coal, splinty	1	5	2	2
5.	Slate, pavement				

The Daniel Hefner Farm Mine (No. 100 on Map II), on Marsh Fork, 1.5 miles northwest of Pickens, at elevation 2690' B., had fallen partly shut, only one foot of coal being visible. The following opening is reported by Teets at the head of the same fork:

Peter Swint Farm Mine—No. 101 on Map II.

On Marsh Fork, 1.2 miles southwest of Pickens; Campbell Creek (Peerless) Coal; elevation, 2850' B.

			Ft.	In.
1. Coal, medium-hard	1'	7"		
2. Coal, harder, bony	1	0	2	7
3. Slate				

This opening had fallen shut, the above section being measured at the mine mouth.

The Mack Stadler Prospect (No. 102 on Map II), on the head of Fall Run of Holly River, near the Webster County line, 1.8 miles southwest of Pickens, had fallen partly shut, but showed one foot of coal at elevation 2755' B.

The following prospect has been opened within the last few years but when visited by the writer had fallen shut, the coal section being reported by A. W. Ewing, Civil Engineer, of Pickens:

Quality Coal and Coke Company Prospect—No. 103 on Map II.

On Right Fork of Buckhannon River 2.3 miles northwest of Pickens; Campbell Creek (Peerless) Coal; elevation, 2570' B.

			Ft.	In.
1. Shale, dark, sandy, visible			6	0
2. Coal, reported	1'	0"		
3. Shale and slate, reported	5	0		
4. Coal, reported	2	7	8	7

The above prospect is 130 feet above the base of the Eagle Coal, as mined by the same company at the old Gimmel opening.

The following opening was examined by Teets:

James Pickens Prospect—No. 104 on Map II.

On Right Fork of Buckhannon River 0.3 mile southeast of Pickens; Campbell Creek (Peerless) Coal; elevation, 2890' B.

				Ft.	In.
1. Concealed					
2. Coal prospect, Alma Coal (2915' B.)					
3. Concealed and slate				22	0
4. Coal, soft	1'	7"	Campbell Creek (2890' B.)	2	8
5. Coal, bony	0	4			
6. Coal, harder	0	9			
7. Slate and concealed				5	0
8. Coal, thickness concealed					

A sample was collected from this opening, the composition of which is published under Mine No. 104 in the Table of Coal Analyses at the end of this Chapter.

The two following openings were noted by Teets farther up the same fork:

M. B. Stadler Farm Mine—No. 105 on Map II.

On Right Fork of Buckhannon, 0.8 mile south of Pickens; Campbell Creek (Peerless) Coal; elevation, 2860′ B.

				Ft.	In.
1.	Slate				
2.	Coal, soft	1′	7″		
3.	Coal, bony	1	3	2	10
4.	Slate, pavement				

Marshall Arbogast Farm Mine—No. 106 on Map II.

On Right Fork of Buckhannon, 1 mile south of Pickens; Campbell Creek (Peerless) Coal; elevation, 2915′ B.

				Ft.	In.
1.	Slate				
2.	Coal, soft	1′	8″		
3.	Coal, bony	1	3	2	11
4.	Slate, pavement				

The coal is reported by Teets at two points on Little Sugar Creek, tributary to the Elk River drainage system. The Bird Casto Farm Mine (No. 107 on Map II), located 2.5 miles southwest of Pickens, measured 2′ 0″ of clean coal, at elevation 3060′ B.

L. M. Hull Farm Mine—No. 108 on Map II.

On Little Sugar Creek, 3 miles southwest of Pickens; Campbell Creek (Peerless) Coal; elevation, 3050′ B.

				Ft.	In.
1.	Slate, black, visible			4	0
2.	Coal, soft	2′	1″		
3.	Coal, bony	0	6	2	7
4.	Slate, pavement				

The four following openings are reported by Teets on Left Fork of Buckhannon River:

Daniel Tenney Farm Mine—No. 109 on Map II.

On Left Fork of Buckhannon River, 0.7 mile southwest of Hartridge; **Campbell Creek (Peerless) Coal**; elevation, 3325′ B.

		Ft.	In.
1. Slate			
2. Coal, soft	1′ 10″		
3. Coal, harder	0 9	2	7
4. Slate, pavement			

The **M. N. Hicks Farm Mine (No. 110 on Map II)**, on Left Fork of Buckhannon, 0.9 mile southwest of Hartridge, measured 2′ 7″ of clean coal, at elevation 3325′ B. The **Gottfried Busky Farm Mine (No. 111 on Map II)**, on Left Fork of Buckhannon, 2 miles southeast of Pickens, at elevation 3325′ B., had fallen shut and its thickness was not learned. The **J. W. Hartman Heirs Farm Mine (No. 112 on Map II)**, on Left Fork of Buckhannon, 1.4 miles west of the Parting Springs, at elevation 3440′ B., had fallen shut, but the coal was reported 2′ 3″ thick.

Several openings have been made on the high mountain ridge that divides the Buckhannon River drainage from that of Sugar Creek and Back Fork of Elk, the coal being of exceptional purity. The **J. W. Hartman Heirs Farm Mine (No. 113 on Map II)**, on the Sugar Creek side, 1.5 miles west of the Parting Springs, measured 3′ 0″ of clean, medium-hard coal at elevation 3415′ B.

Casper Winkler Farm Mine—No. 114 on Map II.

On Sugar Creek, 1 mile west of the Parting Springs; **Campbell Creek (Peerless) Coal**; elevation, 3510′ B.

	Ft.	In.
1. Slate, dark		
2. Coal, medium-hard	2	11
3. Slate, pavement		

A sample was collected from this opening, the composition of which is published under **Mine No. 114** in the Table of Coal Analyses at the end of this Chapter.

The **Louis Wuchner Farm Mine (No. 115 on Map II)**, on the Sugar Creek side, 0.8 mile southeast of the Parting Springs, at elevation 3550′ B., had fallen shut, but was reported 3′ 0″ thick. The **S. B. Elkins Heirs Farm Mine (No. 116 on Map II)**, on Left Fork of Buckhannon, 0.5 mile northwest of the Parting Springs, was reported by Teets as measuring 2′ 11″ of columnar coal at elevation 3535′ B.

Ida Smiley Farm Mine—No. 117 on Map II.

On Long Run of Buckhannon River, 0.3 mile northeast of the Parting Springs; **Campbell Creek (Peerless) Coal**; elevation, 3675′ B.

				Ft.	In.
1.	Slate, dark				
2.	**Coal**, splint	0′	5″		
3.	**Coal**, medium-hard	2	10	3	3
4.	Slate, pavement				

Edward L. Eggleston Farm Mine—No. 118 on Map II.

On Morgan Camp Run of Buckhannon, 0.8 mile northeast of the Parting Springs; **Campbell Creek (Peerless) Coal**; elevation, 3685′ B.

				Ft.	In.
1.	Slate, dark				
2.	**Coal**, splinty	0′	5 ″		
3.	**Coal**, medium-hard	2	8½		
4.	Slate, dark	0	0½		
5.	**Coal**	0	5	3	7
6.	Slate, pavement				

Campbell Creek (Peerless) Coal, Beverly District.

In Beverly District the Campbell Creek (Peerless) Coal appears to be of value in Cheat Mountain between Bowden and Bemis, having been prospected at the southern end, next to Fishinghawk Creek, but having received no attention farther north. The **Davis Coal Land Company Exposure (No. 119 on Map II)**, on the old Bemis Railroad grade, now a county road, on Right Fork of Fishinghawk Creek 1.6 miles northwest of Bemis, showed 1′ 4″ of clean coal at outcrop, at elevation 3305′ B.

The following opening was made many years ago and furnished fuel for the construction of the Coal and Iron (now Western Maryland) Railway:

West Virginia Pulp & Paper Company Farm Mine—No. 120 on Map II.

Near old county road between forks of Fishinghawk Creek 1.3 miles west of Bemis; **Campbell Creek (Peerless) Coal**; elevation, 3335′ B.

				Ft.	In.
1.	Shale, dark, with iron carbonate nodules			5	0
2.	**Coal**			0	5
3.	Shale, dark			5	0
4.	**Coal**, soft, columnar	2′	4″		
5.	Shale, gray	0	6		
6.	**Coal**	0	3		
7.	Shale, gray	3	0		
8.	**Coal**, soft, good, concealed, but previously noted by I. C. White	1	1	7	2

When visited by the writer in the early spring of 1917 this opening was partly filled with water and frozen over at the mouth and a full measurement of the section could not be secured but No. 8 is inserted on the authority of Dr. I. C. White who once visited the place at an earlier date. A sample (No. 227R) was collected by the writer from No. 4 of section and was analyzed on a moisture-free basis by chemists of the company as follows:

	Per cent.
Volatile Matter	29.02
Fixed Carbon	65.93
Ash	5.05
Total	100.00
Sulphur	1.39
B. T. U.	14,750

A sample of the same mine was taken by Dr. White, presumably from Nos. 4 and 8 of section, the result of which as analyzed by B. H. Hite, and as formerly published in Volume II(A), page 236, is published under **Mine No. 120** in the Table of Coal Analyses at the end of this Chapter. The fact that the sample of Dr. White contains 1.60 per cent. of sulphur, as compared to a figure of 1.39 in the sample of the writer, would apparently indicate that this impurity is greater in the lower bench.

Campbell Creek (Peerless) Coal, Valley Bend and Huttonsville Districts.

In Valley Bend District the Campbell Creek (Peerless) Coal has not been prospected but this district lies immediately south of Fishinghawk Creek and should have the same coal as found at **Mine No. 120.** In Huttonsville District it has not been prospected but the western part of this district, west of Tygart Valley, adjoins Middle Fork where the coal is good and hence there is reason to believe that it continues into Huttonsville District. In the portion of the district covering part of the Shavers Fork Valley it has not been prospected at outcrop so far as known but the **West Virginia Pulp & Paper Company No. 3 (52) Coal Test Boring** west of Cheat Bridge reports it 1′ 6″ thick and the **No. 8 (57)** of the same company southeast of Cromer Top gives 0′ 7″. There should be some thicker coal in the northern end of this district.

Campbell Creek (Peerless) Coal, Mingo District.

In Mingo District the Campbell Creek (Peerless) Coal has not been prospected, so far as known, but it should occur in a few of the high tops south of the Pickens region and should be of about the same character as on Turkeybone Mountain.

Quantity of Campbell Creek (Peerless) Coal Available.

The following table, compiled from planimetric measurements by Tucker and Grow of the areas indicated on Figure 23 and outcropped on Map II, shows the probable amount of Campbell Creek (Peerless) Coal in the county:

Probable Amount of Campbell Creek (Peerless) Coal.

Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal. (2000 lbs.)
Roaring Creek	2	32.30	20,672	1,800,944,640	72,037,786
Middle Fork	2½	73.50	47,040	5,122,656,000	204,906,240
Beverly	2	3.55	2,272	197,936,640	7,917,465
Valley Bend	2½	4.65	2,976	324,086,400	12,963,456
Huttonsville	2½	4.90	3,136	341,510,400	13,660,416
Mingo	2½	3.65	2,336	254,390,400	10,175,616
Totals		122.55	78,432	8,041,524,480	321,660,979

EAGLE COAL.

The Eagle Coal, previously discussed in Chapter VI, page 253, is medium-hard, varying from one to four feet in thickness, and occasionally having bony streaks in the southwestern part of the county where it has principally been prospected. For a limited time it was mined commercially at the plant of the Quality Coal and Coke Company at what is known as the old Gimmel opening on Buckhannon River below Pickens. In chemical quality it is medium-high in volatile matter, and reasonably low in ash, sulphur, and phosphorus. Figure 24 shows the areas in which it is believed to have possible minable thickness and on Map II its outcrops for the same territory are delineated.

Eagle Coal, Roaring Creek District.

In Roaring Creek District the Eagle Coal is only 0′ 3½″ thick in the Norton Section, page 130. In the Maxwell & Crawford No. 3 (3) Coal Test Boring it is 3′ 5″ thick, but

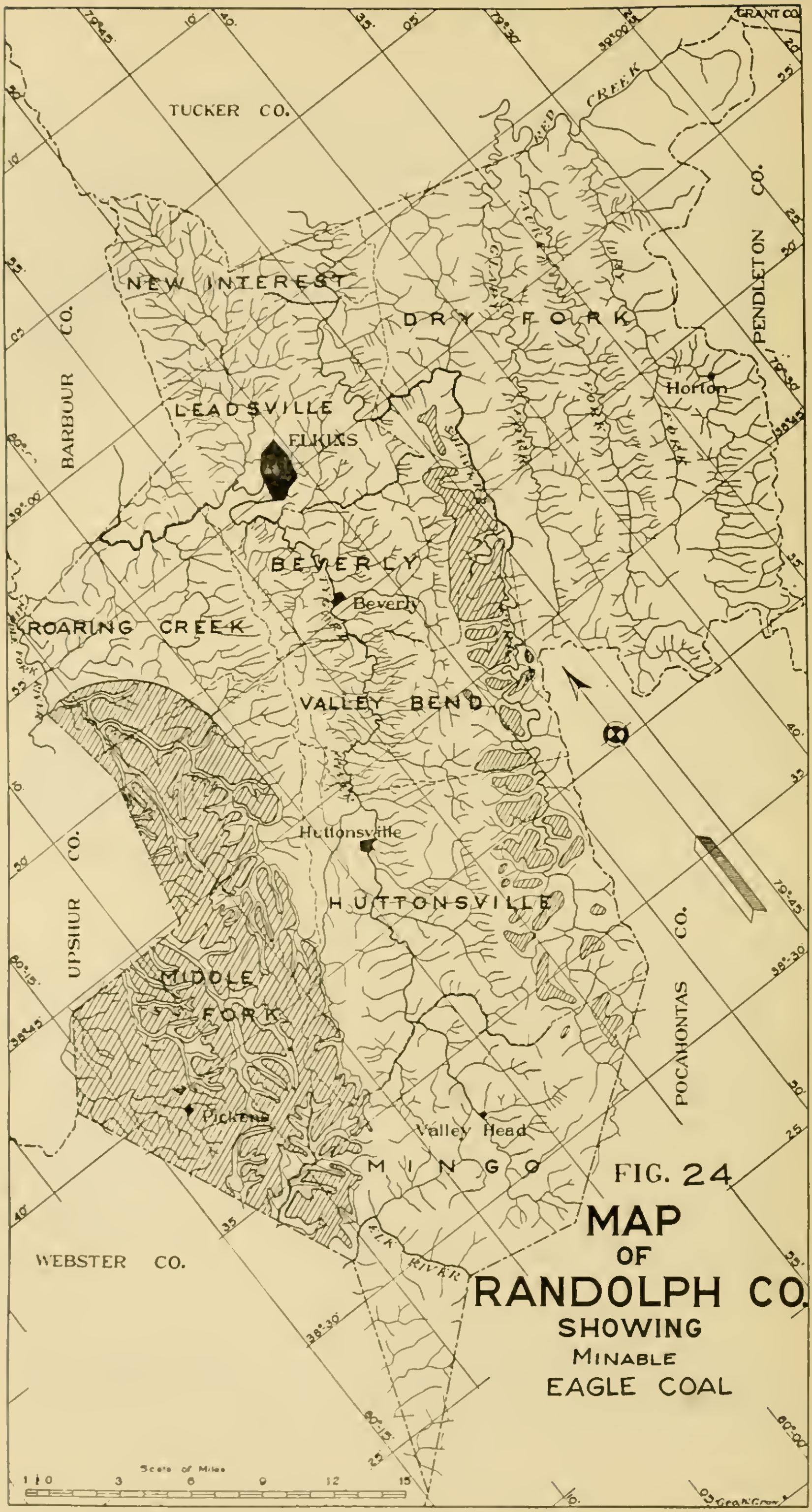


FIG. 24

MAP OF RANDOLPH CO. SHOWING MINABLE EAGLE COAL very bony and apparently worthless. In the **P. J. Cain No. 1 (13) Coal Test Boring** it is 0′ 3″ thick and bony. Toward the southwestern corner of the district, however, it appears to thicken and may furnish some minable coal. In this region it was once opened at **Coal Prospect No. 128 on Map II,** on Left Fork of Middle Fork River 0.7 mile south of Gale at elevation 1850′ B., with an interval of only 60 feet below the Campbell Creek (Peerless) Coal. This old digging had fallen shut and could not be measured.

Eagle Coal, Middle Fork District.

In Middle Fork District the Eagle is noted in various measured sections in Chapter V, and in the present Chapter it is recorded in coal test borings as follows:

Cassity Fork Boom & Lumber Co. No. 1 (16) ---1′	5″ (shaly)
Cassity Fork Boom & Lumber Co. No. 2 (17) ---1′	6″
Cassity Fork Boom & Lumber Co. No. 3 (18) --1′	8″
Elkhorn Coal Corporation No. 2 (26) ----------0′	6″
J. A. McCauley No. 1 (35) -----------------4′	0″
Holly Lumber Company Water Well (36) ----4′	0″

Several openings in this coal have been made in the drainage of Middle Fork River, showing in some cases a fair thickness of low-sulphur coal. The following prospects were noted:

Lloyd Zickefoose Farm Mine—No. 129 on Map II.

On Long Run of Middle Fork River, 0.2 mile east of Loda; **Eagle Coal**; elevation, 2630′ B.

	Ft.	In.
1. Slate, sandy		
2. **Coal**, medium-hard	2	11
3. Slate, pavement		

A sample was collected from this opening, the composition of which is published under **Mine No. 129** in the Table of Coal Analyses at the end of this Chapter.

The **Frank Phares Prospect (No. 130 on Map II)**, on Left Fork of Middle Fork one mile northwest of Cassity, measured 3′ 9″ at elevation 2400′ B., as detailed in the Cassity Section, page 133.

Stephen Womelsdorff Prospect—No. 131 on Map II.

On Cassity Fork of Middle Fork River, 1 mile southeast of Cassity; **Eagle Coal**; elevation, 2185′ B.

			Ft.	In.
1. Slate, black			4	0
2. Coal, soft, columnar	1′	9″		
3. Slate, black	0	3		
4. Coal	1	0	3	0
5. Slate, pavement				

The **Rosenkrantz Heirs Prospect (No. 132 on Map II)**, on Cassity Fork 4.1 miles east of Cassity at elevation 3040′ B., and apparently representing the Eagle Coal, had fallen shut but was reported as 4′ 6″ thick by Walter Brady, a resident. An attempt was once made to open the coal at **Prospect No. 133 on Map II**, on Left Fork of Middle Fork River one mile north of Adolph at elevation 2415′ B., but the place had fallen shut, only a few lumps of coal being visible on the dump. The **Simeon Kittle Farm Mine (No. 134 on Map II)**, on Left Fork of Middle Fork River, 2.1 miles southeast of Adolph, measured 2′ 6″ thick at elevation 2675′ B., as exhibited in detail in the Big Laurel Thicket Section, page 139.

James Shannon Farm Mine—No. 135 on Map II.

On Left Fork of Middle Fork River, 1.8 miles southeast of Adolph; **Eagle Coal**; elevation, 2805′ B.

			Ft.	In.
1. Shale, dark			10	0
2. Coal, bony	0′	6″		
3. Coal, soft, columnar	1	7	2	1
4. Slate, pavement				

A sample was collected from No. 3 of section, the composition of which is published under **Mine No. 135** in the Table of Coal Analyses at the end of this Chapter.

Several openings have been made on the waters of Buckhannon River, the five following being reported by Teets:

Elkhorn Coal Corporation Prospect—No. 136 on Map II.

On Lower Dry Run of Left Fork of Buckhannon River, 2.4 miles southeast of Palace Valley; **Eagle Coal**; elevation, 2815′ B.

			Ft.	In.
1. Slate, black, cannelly				
2. Coal	0′	4″		
3. Coal, bony	0	5		
4. Coal, soft	1	3		
5. Slate, gray	1	4		
6. Coal, soft	1	3	4	7
7. Slate, pavement				

The **G. W. Sanderson Farm Mine (No. 137 on Map II)**, on Left Fork of Right Fork of Buckhannon River just west of Czar at elevation 2250′ B., had fallen shut, its thickness not being learned. The **John J. Zumbach Farm Mine (No. 138 on Map II)**, on the same fork just southeast of Czar, measured 1′ 3″ of soft coal at elevation 2255′ B.

J. J. Wuerzer Farm Mine—No. 139 on Map II.

On Trout Run, 1 mile southeast of Czar; **Eagle Coal**; elevation, 2455′ B.

			Ft.	In.
1.	Sandstone, visible		2	0
2.	Slate, black		3	0
3.	**Coal**, bony	0′ 4″		
4.	**Coal**, soft	2 2	2	6
5.	Slate, pavement			

George Smith Farm Mine—No. 140 on Map II.

On Trout Run, 1 mile southeast of Czar; **Eagle Coal**; elevation, 2450′ B.

			Ft.	In.
1.	Sandstone, visible		5	0
2.	Slate, black		3	0
3.	**Coal**, bony	0′ 4″		
4.	**Coal**, soft	2 2	2	6
5.	Slate, pavement			

The coal was once opened at **Prospect No. 141 on Map II**, on Middle Fork of Buckhannon River 0.6 mile south of Newlonton at elevation 2000′ B., but its thickness was not learned. It is also reported by Teets at the following locality:

William Kerign Farm Mine—No. 142 on Map II.

On Middle Fork of Buckhannon River, 2.3 miles southeast of Newlonton; **Eagle Coal**; elevation, 2225′ B.

			Ft.	In.
1.	Slate, black			
2.	**Coal**	0′ 4″		
3.	Slate, gray	0 9		
4.	**Coal**, good	1 1	2	2
5.	Slate, pavement			

As previously noted the coal was found in the **J. A. McCauley No. 1 (35) Coal Test Boring** on Right Fork of Buckhannon just west of Silica, at depth of 12 feet and with a thickness of 4 feet, according to Mr. McCauley. The coal comes to the surface 0.2 mile southeast of Silica at the old sand plant, where, at **Prospect No. 143** on **Map II,** it is reported to have been stripped from the river bed at low water, its elevation being 2360' B. The following opening exhibits what is probably the maximum development of Eagle Coal in the western part of the county:

John Gimmel Farm Mine—No. 144 on Map II.

On Right Fork of Buckhannon River, 0.7 mile south of Silica; **Eagle Coal**; elevation, 2440' B.

			Ft.	In.
1.	Slate			
2.	**Coal**, bony	0' 6"		
3.	**Coal**, hard, splinty	2 2		
4.	**Coal**	1 4	4	0
5.	Slate, pavement			

A sample from this opening was collected by Teets, the composition of which is published under **Mine No. 144** in the Table of Coal Analyses at the end of this Chapter.

At a later date a commercial mine was started at this locality by the Quality Coal and Coke Company but has now been discontinued, the coal having thinned rapidly under the mountain according to A. W. Ewing, civil engineer, of Pickens.

Eagle Coal, Beverly, Valley Bend, and Huttonsville Districts.

In Beverly District the Eagle Coal has not been opened, so far as known, but its presence in considerable quantity in bore holes farther south in the Cheat Mountain country creates a strong presumption of its presence northward from Bemis and Fishinghawk Creek.

In Valley Bend District it has not been opened but its blossom is noted in the Cheat Junction Section, page 162, and the close proximity of this territory to the borings of Huttonsville District indicates that it should occur in some quantity.

In Huttonsville District west of Tygart Valley the Eagle Coal has not been opened so far as known but this territory adjoins Middle Fork District where there are numerous prospects and the coal should be about the same. In the portion of the district covering Cheat Mountain and Shavers Fork, the **West Virginia Pulp & Paper Company No. 1A (50) Coal Test Boring** shows 2' 6"; the **No. 3 (52)** of the same company shows 2' 2"; and the **No. 8 (57)** of the same company shows 2' 3", all of these cuttings being clean coal. A sample of coal from the latter boring, analyzed on a moisture-free basis by chemists of the company, showed the following:

Proximate Analysis.

	Per cent.
Volatile Matter	22.13
Fixed Carbon	72.41
Ash	5.46
Sulphur	1.76

Ultimate Analysis.

	Per cent.
Carbon	78.19
Hydrogen	5.86
Nitrogen	1.71
B. T. U.	14,822

Eagle Coal, Mingo District.

In Mingo District the Eagle Coal has not been prospected, so far as known, but there are several openings in the adjacent portion of Webster County along Point Mountain. The **Hale and Kinney Prospect (No. 145 on Map II)**, in Fork Lick District, Webster County, on the north side of Point Mountain 1.9 miles northeast of Waneta, measured 2′ 0″ of clean coal at elevation 3455′ B. There should be a small acreage of this coal in the western edge of Mingo District and probably also in the northeastern corner on the waters of Shavers Fork.

Quantity of Eagle Coal Available.

The following table, compiled from planimetric measurements of the territory indicated on Figure 24 by R. C. Tucker and Geo. W. Grow, indicates the probable amount of Eagle Coal in the county:

Probable Amount of Eagle Coal.

Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal. (2000 lbs.)
Roaring Creek	2	6.90	4,416	384,721,920	15,388,877
Middle Fork	2	102.90	65,856	5,737,374,720	229,494,989
Beverly	1½	4.80	3,072	200,724,480	8,028,979
Valley Bend	1½	7.75	4,960	324,086,400	12,963,456
Huttonsville	2	11.95	7,648	666,293,760	26,651,750
Mingo	2	8.00	5,120	446,054,400	17,842,176
Dry Fork	1½	0.11	70	4,573,800	182,952
Totals		142.41	91,142	7,763,829,480	310,553,179

GILBERT COAL.

The Gilbert Coal, previously discussed in Chapter VI, page 255, is widely persistent throughout the southern part of the county and should eventually furnish a very considerable tonnage of good coal. Since 1910 it has been mined by the West Virginia Pulp & Paper Company at Hopkins in the southern end of the valley of Shavers Fork and it has been prospected at various other points. It varies from one to five feet in thickness, being often clean and pure in the localities of moderately thin section but containing streaks of bone and bony coal where the thickness expands. It appears to be low in sulphur and medium-high in volatile matter. Figure 25 shows its probable minable extent and on Map II its outcrop is delineated for the same territory.

Gilbert Coal, Roaring Creek District.

The Gilbert Coal does not appear to be of value in Roaring Creek District. In the Norton Section, page 130, it is 1′ 1″ thick, and slaty; in the **James Curtis No. 1 (1) Coal Test Boring** it is 2′ 0½″ thick, but bony at the base; and in the **P. J. Cain No. 1 (13) Coal Test Boring** it is only 0′ 5″ thick.

Gilbert Coal, Middle Fork District.

In Middle Fork District the Gilbert Coal is rather widely persistent and should furnish considerable fuel. In the Cassity Section, page 133, it is noted with a visible thickness of 1′ 0″ at elevation 2263′ L. In the Adolph Section, page 138, it is 1′ 4″ thick, at elevation 2295′ B. In the Big Laurel Thicket Section, page 139, it is 0′ 10″ thick at elevation 2560′ B. In the present Chapter the following borings report it:

Cassity Fork Boom and Lumber Co. No. 1 (16)	0′ 6″
Cassity Fork Boom and Lumber Co. No. 2 (17)	1′ 4″
Elkhorn Coal Corporation No. 2 (26)	0′ 8″

Most of the prospects found west of Tygart Valley were along Left Fork of Middle Fork River. **Coal Prospect No. 146 on Map II**, located on this stream 2.4 miles north of Long, measured 1′ 11″ of clean coal at elevation 2125′ B., according to Teets. At **Prospect No. 147 on Map II**, on Middle Fork River, 0.4 mile west of Cassity, one foot of coal was visible at elevation 2263′ L. At the **Robert Fox Farm Mine (No. 148 on Map II)** on Middle Fork River 1.6 miles south of Cassity,

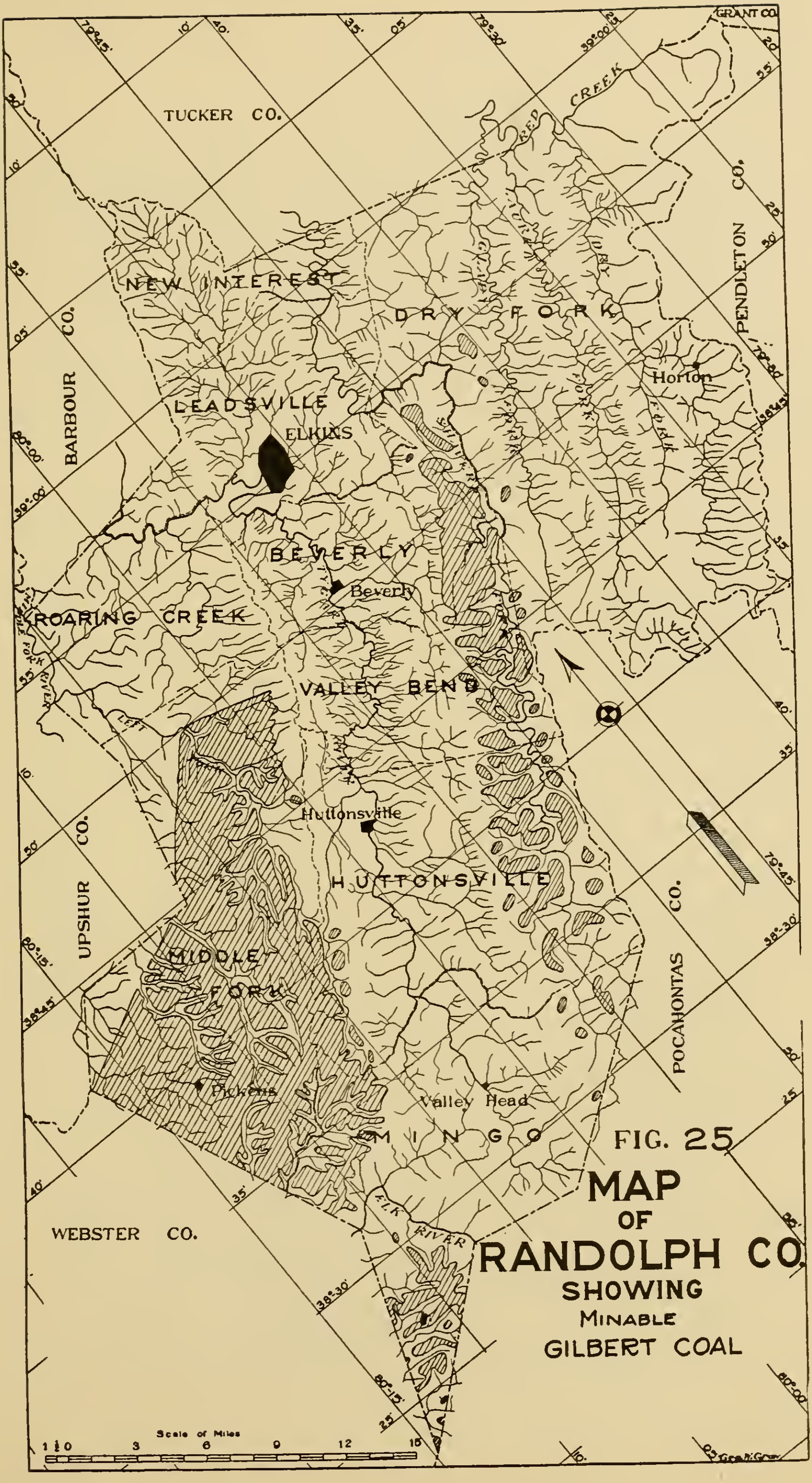


FIG. 25
MAP OF RANDOLPH CO. SHOWING MINABLE GILBERT COAL

one foot of coal was visible at elevation 2215′ B., but the opening had partly fallen shut, the thickness being reported as two feet. The **Robert Fox Prospect (No. 149 on Map II)**, on Middle Fork River 1.7 miles south of Cassity at elevation 2220′ B., had fallen shut and its thickness was not learned.

The coal was opened at **Prospect No. 150 on Map II**, on Stonecoal Run 2.5 miles south of Cassity at elevation 2175′ B., but the place had fallen shut and could not be measured. At the **Charles Fincham Farm Mine (No. 151 on Map II)**, on Laurel Run of Middle Fork River two miles north of Adolph, there was 1′ 1″ of coal visible at elevation 2260′ B., the entire seam being reported 2′ 0″ thick.

The **Lincoln Currence Prospect (No. 152 on Map II)**, on the west side and near the top of Rich Mountain, 2.7 miles northeast of Adolph, measured 2′ 9″ of clean, soft coal at elevation 3205′ B., as recorded in the Mill Creek Section, page 164.

The **Moore-Keppel & Company Prospect (No. 152A on Map II)**, on Schoolcraft Run 1.3 miles northwest of Adolph, measured 1′ 6″ of clean coal at elevation 2395′ B. **Farm Mine No. 152B on Map II**, on a branch of Schoolcraft Run 1.6 miles north of Blue Rock, measured 2′ 4″ of clean coal at elevation 2830′ B., the opening being located well up toward the crest of the Hiram Anticline. **Prospect No. 152C on Map II**, on Middle Fork River 0.8 mile north of Adolph, measured 1′ 4″ of coal at elevation 2295′ B.

Coal Prospect—No. 152D on Map II.

On Middle Fork River, 0.6 mile north of Adolph; **Gilbert Coal**; elevation, 2350′ B.

			Ft.	In.
1.	Shale			
2.	**Coal**	0′ 2″		
3.	Shale, gray	0 5		
4.	**Coal**	0 6		
5.	Shale, gray	0 8		
6.	**Coal**	0 8	2	5
7.	Slate, pavement			

Christian Goss Farm Mine—No. 152E on Map II.

On Birch Fork of Middle Fork River, 0.5 mile southeast of Blue Rock; **Gilbert Coal**; elevation, 2875′ B.

			Ft.	In.
1.	Sandstone, massive			
2.	Shale, sandy, dark		3	[illegible]
3.	**Coal, soft**	1′ 3″		
4.	Shale, gray	0 4		
5.	**Coal, soft**	1 0	2	7

The **Christian Goss Prospect (No. 152F on Map II)**, on Birch Fork of Middle Fork River 0.6 mile southeast of Blue Rock, measured 2′ 4″ of clean coal at elevation 2885′ B. Another bench of coal 2′ 6″ thick was reported several feet below the upper layer.

On the waters of Buckhannon River the coal was noted at a few points by Teets. The **Steven Morgan Farm Mine (No. 152G on Map II)**, on Left Fork, 0.2 mile south of Palace Valley, measured 2′ 3″ of clean coal at elevation 2445′ B. The **F. F. Zumbach Prospect (No. 152H on Map II)**, on Left Fork of Right Fork of Buckhannon River at Helvetia at elevation 2275′ B., had fallen shut and could not be measured.

Gilbert Coal, Beverly and Valley Bend Districts.

In Beverly and Valley Bend Districts the Gilbert Coal has not been prospected by drifts or borings, so far as known, but it is of considerable thickness to the southward and has also been opened in Shavers Mountain east of Bowden and in the same mountain near the mouth of Otter Creek in Tucker County. It is therefore believed that in the two districts named there should be minable Gilbert Coal in Cheat Mountain as far north as Bowden.

Gilbert Coal, Huttonsville District.

In Huttonsville District the Gilbert Coal was once opened at the **West Virginia Pulp & Paper Company Prospect (No. 153 on Map II)**, on the Staunton and Parkersburg Pike just west of the summit of White Top Mountain 0.9 mile northwest of Cheat Bridge at elevation 3908′ L. This coal was used by the United States Army during the Civil War for the use of a large body of Union troops which camped in this gap. The old opening has long ago fallen shut and only a blossom can now be seen at the roadside but according to H. F. Cromer, land agent of the company, it measured 2′ 4″, as recorded in the Cheat Bridge Section, page 167.

In the diamond drill holes of the company in this district, published in the present Chapter, the following thicknesses of Gilbert Coal have been noted:

W. Va Pulp & Paper Co. No. 1A (50)	2′	4″	
W. Va. Pulp & Paper Co. No. 4 (53)	3′	0″	(slaty)
W. Va. Pulp & Paper Co. No. 5 (54)	3′	0″	
W. Va. Pulp & Paper Co. No. 8 (57)	2′	6″	
W. Va. Paper & Pulp Co. No. 10 (61)	1′	3″	
W. Va. Pulp & Paper Co. No. 12 (63)	2′	9″	

Analyses of several of these cores on a moisture-free basis were made by the company, as follows:

Proximate Analysis:	Hole No. 8 (57). Per cent.	Hole No. 10 (61). Per cent.	Hole No. 12 (63). Per cent.
Volatile Matter	20.22	17.07	22.62
Fixed Carbon	75.87	66.54	71.25
Ash	3.91	16.39	6.13
Sulphur	0.81	3.87	0.58
Phosphorus	0.0153	----	----
Ultimate Analysis:			
Carbon	78.19	----	----
Hydrogen	5.86	----	----
Nitrogen	1.71	----	----
B. T. U.	15,194	12,876	14,720

With the exception of Hole No. 10 (61), where the coal was only 1′ 3″ thick, these analyses reveal a very good grade of coal.

In the portion of Huttonsville District west of Tygart Valley, the Gilbert Coal has not been prospected but there are adjacent openings to the north in Middle Fork, as previously described. In the **Ward & Hutton No. 2 (66) Coal Test Boring**, page 490, it is reported as 4′ 0″ thick, but as having a heavy bed of fire clay in the section.

Gilbert Coal, Mingo District.

In Mingo District the Gilbert Coal has not been opened west of Tygart Valley, so far as known, but in the **Ward & Hutton No. 1 (67) Coal Test Boring**, it is recorded as 0′ 10″ thick and slaty; and in the **No. 3 (68)** of the same company it is 2′ 6″ thick.

In the Shavers Fork portion of the district it is noted as 5′ 8″ thick, with 0′ 10″ of sandstone near the top, in the **West Virginia Pulp & Paper Company No. 1 (69) Coal Test Boring.** This boring is located slightly northwest of the Hopkins Mine openings, descriptions of which follow:

West Virginia Pulp & Paper Company, Hopkins Mine (North Opening)—No. 154 on Map II.

Mingo District; on Cheat Mountain 0.6 mile west of Hopkins; **Gilbert Coal**; elevation, 4400′ B.

Section measured in Fourth Right:

	Ft.	In.
1. Slate, dark		
2. **Coal**, hard, bony	0′	10″
3. Slate, dark	0	6
4. **Coal**	0	2
5. Slate, dark	0	6
6. Bone	0	2
7. **Coal**, soft	0	11

			Ft.	In.
8. Coal, hard	0	7		
9. Bone	0	2½		
10. Coal, medium-hard	3	1½		
11. Coal, bony	0	2	7	2
12. Slate, pavement				

Another section was measured in Fourth Right, as follows:

			Ft.	In.
1. Slate, dark				
2. Coal, hard, bony	0′	10″		
3. Slate, dark	0	6		
4. Coal	0	2		
5. Slate, dark	0	6		
6. Bone	0	4		
7. Coal, soft	0	9		
8. Bone	0	3		
9. Coal	0	3		
10. Bone	0	1		
11. Coal, medium-soft, columnar	3	3		
12. Coal, slightly bony	0	2	7	1
13. Slate, pavement				

The two sections above noted, which were measured by the writer in 1917, differ considerably in the interpretation of bone and coal, although done by the same observer in the same heading. A sample (No. 228R) was collected from Nos. 7-12, inclusive, of the second section, and another (No. 229R) was collected from Nos. 7, 9, and 11 of the same section, being analyzed on a moisture-free basis by company chemists, as follows:

	No. 228R. Per cent.	No. 229R. Per cent.
Volatile Matter	28.66	30.81
Fixed Carbon	55.35	57.07
Ash	15.99	12.12
Sulphur	0.67	0.80
B. T. U.	12,939	13,556

In September, 1927, the writer again visited this mine and measured the following sections:

West Virginia Pulp & Paper Company, Hopkins Mine (South Opening)—No. 155 on Map II.

Mingo District, on Cheat Mountain, 0.5 mile west of Hopkins: Gilbert Coal; elevation, 4410′ B.

Section in Main Air-Course, about 1500 feet from mouth:

				Ft.	In.
1.	Slate, black, soft				
2.	Slate, black, ferruginous, "Iron belt"			0	8
3.	Coal, slaty	0'	1"		
4.	Coal, medium-soft	0	10		
5.	Coal, hard, slightly bony	1	0		
6.	Coal, medium-soft	2	8	4	7
7.	Shale, gray, pavement				

"Principal office, Cass, W. Va.; daily capacity, 100 tons; 9 miners and 9 laborers employed; coal goes to various plants of company and for local use; greatest rise, west; sample collected from Nos. 4, 5, and 6 of section by David B. Reger; Frank Wright, Assistant Mine Foreman, authority for mine data."

The composition of the above sample (No. 744R), as analyzed by the Survey, is published under **Mine No. 155** in the Table of Coal Analyses at the end of this Chapter.

Section in Main Air-Course, a slight distance from above measurement:

				Ft.	In.
1.	Slate, dark				
2.	Coal, medium-soft	1'	0"		
3.	Slate, black	1	4		
4.	Coal	0	2		
5.	Shale, hard, "Iron belt"	0	2		
6.	Coal, slaty	0	1		
7.	Coal, medium-soft	0	10		
8.	Coal, hard, slightly bony	1	0		
9.	Coal, medium-soft	2	8	7	3
10.	Shale, gray, pavement				

A scrutiny of the four sections above measured shows that the coal at this mine has a total thickness slightly in excess of seven feet, of which the lower four or five feet comprise the practicable mining section, although there is a bench of hard bony coal in this portion. It is believed that if No. 5 of the section measured 1500 feet in the Main Air-Course had been rejected in sampling, the coal would show a greatly reduced content of ash. It is of interest to note that the volatile matter of this coal is considerably higher than that of the Sewell Coal in the same valley, while the sulphur is low enough for most metallurgical purposes.

Gilbert Coal, Dry Fork District.

In Dry Fork District, the only point at which the Gilbert Coal was observed was at the **West Virginia Improvement Company Prospect (No. 156 on Map II)**, made by B. J. Coberly and the writer on the western slope of Big Knob of Shavers Mountain 1.7 miles east of Bowden, at elevation 3520′ B.,

PLATE LI.—View at Fossil Lot 428 along Staunton and Parkersburg Pike 0.7 mile northwest of Durbin, Pocahontas County, showing Catskill strata in which a tree zone at the top of a shale bed has been suddenly smothered in place by an influx of sand. Fragments of **Archaeopteris** and **Dimeripteris** occur in this shale.

(Photo. by E. E. Harris.)

PLATE LII.—View from private road along Cheat Mountain near head of Craven Run four miles northeast of Elkins, looking northeast into valley of Shavers Fork of Cheat. Extreme right background shows McGowan Mountain capped by Pottsville. Ridge at right middle lying just north of Johns Run is mostly Catskill. River valley and left end are Chemung. (Photo. by E. E. Harris.)

PLATE LIII.—View from top of Elliott Ridge east of Beverly, looking northeast. Pond Lick Mountain, at extreme rear, is capped by Pottsville but cleared fields along Greenbrier shelf are visible lower down. At the right is Chenoweth Knob, also capped by Pottsville. Topography across middle is Catskill and probably Harrisburg Peneplain. Immediate grassy slope is Chemung. (Photo. by E. E. Harris.)

PLATE LIV.—View at Valley Head, looking northeast and showing Chemung topography. Low ridge immediately above road is made by Valley Head Sandstone. (Photo. by E. E. Harris.)

where 1′ 0″ of coal was uncovered. There is some doubt, however, whether the full thickness was developed at this shallow prospect.

In Dry Fork District, Tucker County, the **Otter Creek Boom & Lumber Company Exposure (No. 157 on Map II)**, on Coal Run of Otter Creek, 1.3 miles southeast of Otter Station, measured 1′ 9″ of coal at elevation 2890′ B., as recorded in the Otter Creek Section, page 196.

Quantity of Gilbert Coal Available.

The following table, compiled from planimetric measurements by Tucker and Grow of the areas indicated on Figure 25 and Map II, shows the probable amount of minable Gilbert Coal in the county:

Probable Amount of Gilbert Coal.

Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal. (2000 lbs.)
Middle Fork	2	115.375	73,840	6,432,940,800	257,317,632
Beverly	1½	6.05	3,872	252,996,480	10,119,859
Valley Bend	1½	11.30	7,232	472,538,880	18,901,555
Huttonsville	3	17.65	11,296	1,476,161,280	59,046,451
Mingo	2½	15.025	9,616	1,047,182,400	41,887,296
Totals		165.40	105,856	9,681,819,840	387,272,793

According to records of the State Department of Mines 518,289 short tons of Gilbert Coal had been mined in Randolph County at the end of the calendar year 1928. This figure is only a small fraction of the total above indicated.

MINABLE COALS, NEW RIVER GROUP OF POTTSVILLE SERIES.

HUGHES FERRY COAL.

The Hughes Ferry Coal, previously discussed in Chapter VI, page 261, is the uppermost minable bed in the New River Group. Generally it is double-bedded, soft, and columnar, with a thickness varying from one to three feet, and widely persistent except in the northwestern corner of the county. It has not been mined commercially but has

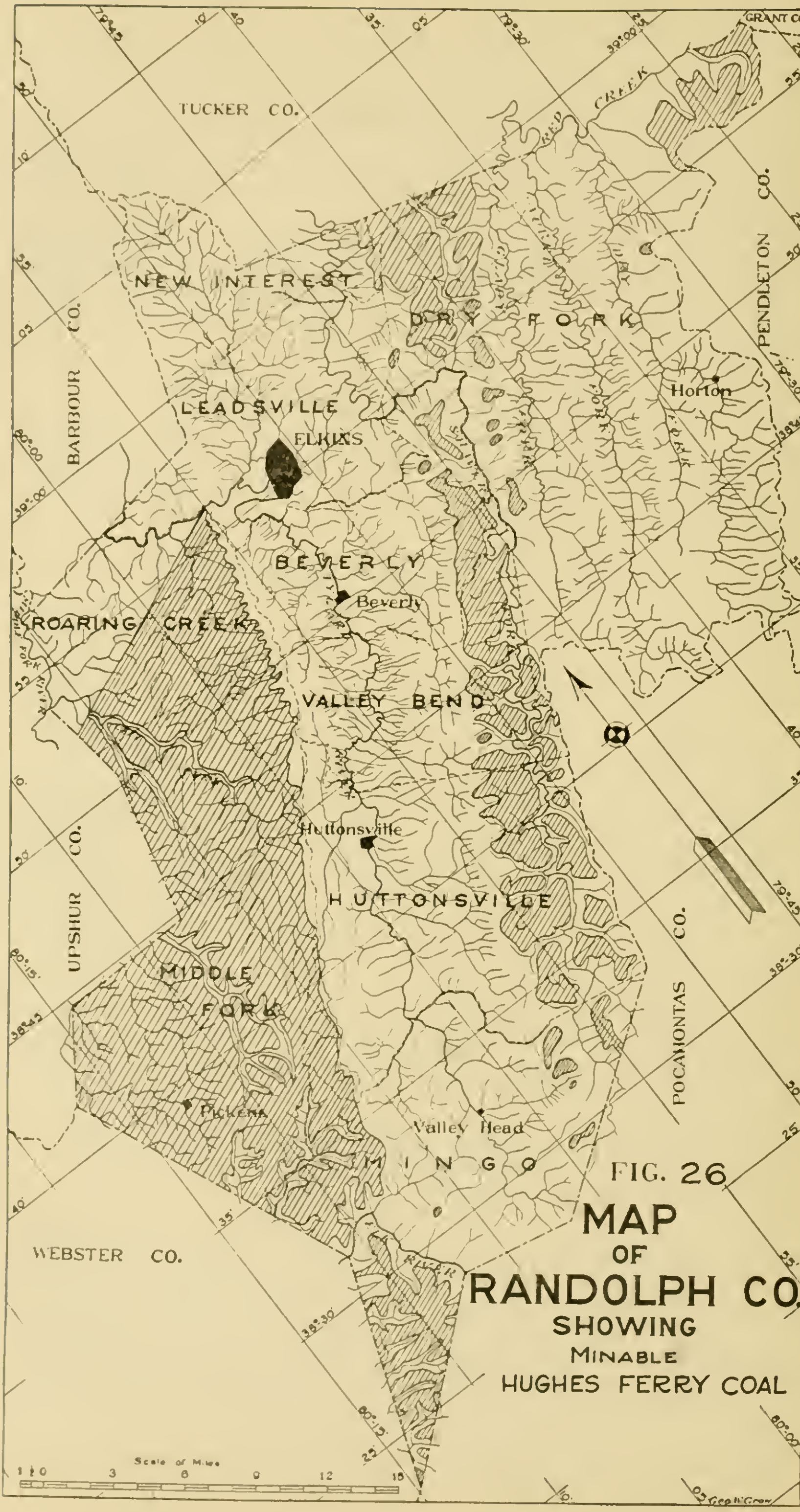


FIG. 26
MAP OF RANDOLPH CO. SHOWING MINABLE HUGHES FERRY COAL

been used for local domestic fuel at various points and has been prospected at numerous localities. It is medium-high in volatile matter, and fairly low in sulphur and ash. Figure 26 shows its supposed minable extent and on Map II its outcrop for the same territory is indicated in detail.

Hughes Ferry Coal, Roaring Creek District.

In Roaring Creek District the Hughes Ferry appears to be of value in the southern part, next to Middle Fork District, and also along the western slope of Rich Mountain. The Norton Section, page 130, record it as 5′ 3½″ thick but no such thickness of clean coal is elsewhere recorded in this seam and this showing may be partly slate. The **James Curtis No. 1 (1) Coal Test Boring** shows it as 2′ 10″ thick, with some slate and bone, as published in the present Chapter. The **Maxwell and Crawford No. 2 (2) Coal Test Boring** records 4′ 7½″, with a large parting of fire clay and shale. The **P. J. Cain No. 1 (13) Coal Test Boring** shows only 0′ 4″.

Coal Prospect No. 162 on Map II, on Left Fork of Middle Fork River, 2.3 miles north of Long, measured 2′ 0″ of clean coal at elevation 2110′ B., according to Teets.

Hughes Ferry Coal, Middle Fork District.

In Middle Fork District the Hughes Ferry is recorded in the **Cassity Fork Boom & Lumber Company No. 3 (18) Coal Test Boring** as 1′ 0″ thick. In the **Womelsdorff Heirs No. 12 (19) Coal Test Boring** it is only 0′ 3″. In the measured sections of Chapter V the Lick Run of Middle Fork Section shows its blossom as one foot thick; the Cassity Section indicates it as only 0′ 6″ thick, at elevation 2215′ B.; the Adolph Section notes it as 1′ 7″; the Big Laurel Thicket Section gives a reported thickness of 1′ 8″; and the Hartridge Section records 2′ 4″.

At the **Dora Poling Farm Mine (No. 163 on Map II),** on Jenks Fork of Middle Fork River 1.2 miles south of Cubana, it was noted by Teets at elevation 2475′ B., but the place had fallen shut and could not be measured. At **Coal Exposure No. 164 on Map II,** on Cassity Fork 0.4 mile southeast of Cassity, it is visible in the public road with a thickness of one foot and an elevation of 2040′ B. At **Coal Prospect No. 165 on Map II,** on Left Fork of Middle Fork River 1.7 miles south of Cassity, the coal has an elevation of 2160′ B., and a reported thickness of one foot.

The following opening, examined by Teets, was published as the Sewell Coal in the Barbour, Upshur, and Western Randolph Report, page 722, but it is apparent that it is too high for the Sewell and it seems to be the Hughes Ferry:

Henry Moats (Now Buey Coffman) Farm Mine—No. 166 on Map II.

On Laurel Branch of Middle Fork River, 2.1 miles northeast of Adolph; Hughes Ferry Coal; elevation, 2880′ B.

			Ft.	In.
1. Slate				
2. Coal, soft	1′	9″		
3. Shale, gray	0	7		
4. Coal, bony	1	0	3	4

A sample was collected from this opening, the composition of which is published under **Mine No. 166** in the Table of Coal Analyses at the end of this Chapter.

The **Arch Shifflet Farm Mine (No. 167 on Map II)**, on the south side of Laurel Branch of Middle Fork River three miles northeast of Adolph, at elevation 2675′ B., had fallen shut, according to Teets, and its thickness was not learned.

From the following opening, which was examined by Teets, a considerable amount of coal has been hauled to Tygart Valley for local domestic fuel:

Joseph Currence Farm Mine—No. 168 on Map II.

On Laurel Branch of Middle Fork River, 3 miles northeast of Adolph; Hughes Ferry Coal; elevation, 2910′ B.

			Ft.	In.
1. Slate				
2. Coal, soft	2′	1″		
3. Shale	0	8		
4. Coal, harder	1	0	3	9
5. Slate, pavement				

A sample was collected from this opening, the composition of which is published under **Mine No. 168** in the Table of Coal Analyses at the end of this Chapter.

In 1926 the writer visited this opening and obtained a slightly different section and an elevation of only 2835′ B., the section being as follows:

			Ft.	In.
1. Shale, dark				
2. Coal, soft, good	1′	10″		
3. Slate, black, soft	0	1		
4. Coal, good	0	5		
5. Shale, dark	0	11		
6. Coal, good	0	10	4	1
7. Fire clay shale, pavement				

The **Joseph Currence Farm Mine (No. 169 on Map II)**, on Laurel Branch of Middle Fork about three miles northeast of

Adolph, was noted by Teets at elevation 2940′ B., but had fallen shut and could not be measured. The writer is of the present opinion that the elevation of this opening should be 2840′ B., as there appears to be an error of about 100 feet in the levels secured by Teets at the two Currence openings.

The coal has been prospected on the waters of Buckhannon River at a few points, the following being noted on Left Fork:

Elkhorn Coal Corporation Prospect—No. 170 on Map II.

On Left Fork of Buckhannon River, at Hartridge; Hughes Ferry Coal; elevation, 2912′ B.

	Ft.	In.
1. Shale, dark, sandy	10	0
2. Coal, soft, columnar	2	0
3. Shale, hard, with plant fossils	3	0

A sample was collected at this opening by Teets, the composition of which is published under Mine No. 170 in the Table of Coal Analyses at the end of this Chapter.

The Emil Metzner Farm Mine (No. 171 on Map II), on Saltlick Run of Left Fork of Right Fork of Buckhannon, 2.5 miles southeast of Helvetia, measured 2′ 0″ of clean, soft, columnar coal at elevation 2655′ B., according to Teets.

At Coal Exposure No. 172 on Map II, along the old Alexander and Eastern Railroad grade 1.2 miles southeast of the Parting Springs, the coal is exposed at elevation 3335′ B., with a thickness of two feet. At the Holly Lumber Company Prospect (No. 173 on Map II), on Zimmerly Run of Back Fork of Elk 1.8 miles south of the Parting Springs, it was once opened at elevation 3160′ B., having a thickness of 1′ 11″.

Hughes Ferry Coal, Beverly District.

In Beverly District the Hughes Ferry Coal has been opened at only a few isolated localities in Cheat Mountain, the following having been observed:

J. M. Bemis & Son Prospect—No. 174 on Map II.

Beverly District; on west side of Cheat Mountain along old county road on waters of Left Fork of Files Creek 1.7 miles northeast of Elkhorn School; Hughes Ferry Coal; elevation, 3425′ B.

	Ft.	In.
1. Shale, Upper Iaeger, black	6	0
2. Coal, at outcrop	1	8
3. Shale, pavement?		

At this locality the coal was poorly exposed and there is some doubt whether the full thickness was obtained.

W. L. Camden Prospect—No. 175 on Map II.

On ridge west of Upper Pond Lick of Shavers Fork, one mile northwest of Flint; **Hughes Ferry Coal**; elevation, 3360′ B.

		Ft.	In.
1.	**Sandstone, Nuttall**, massive, visible	10	0
2.	Concealed and gray shale, **Upper Iaeger**	15	0
3.	**Coal**	0	9

Davis Coal Land Company Prospect—No. 176 on Map II.

On ridge west of Upper Pond Lick of Shavers Fork 1.5 miles northwest of Flint; **Hughes Ferry Coal**; elevation, 3365′ B.

		Ft.	In.
1.	Shale, gray		
2.	**Coal**	1	3
3.	Shale, pavement		

Both of the above prospects were shallow and the coal might thicken farther into the mountain.

Hughes Ferry Coal, Valley Bend District.

In Valley Bend District no openings have been made in the Hughes Ferry, so far as known, but it should be present in considerable thickness in Cheat Mountain between Fishinghawk Creek and the Huttonsville District line.

Hughes Ferry Coal, Huttonsville District.

In the portion of Huttonsville District west of Tygart Valley, the Hughes Ferry Coal has been noted at several points, although it has scarcely been prospected enough to show its full value. At the **Ward & Hutton No. 2 (66) Coal Test Boring** it is only 0′ 9″ thick, with a binder. At the following opening it has been mined for local use:

Lincoln Currence Farm Mine—No. 177 on Map II.

On east side of Rich Mountain facing Right Fork of Mill Creek 2.3 miles northwest of Mill Creek town; **Hughes Ferry Coal**; elevation, 3065′ B.

				Ft.	In.
1.	**Shale, Upper Iaeger**, dark			5	0
2.	Fire clay shale, gray			3	0
3.	**Coal**, soft	1′	6″		
4.	Shale, dark	10	0		
5.	**Coal**	0	10	12	4
6.	Fire clay shale, pavement				

Here it appears that the middle shale, which is only about eight inches thick at the Currence openings on the western side of the ridge, has greatly thickened. The following prospect has been made on Mill Creek:

John F. Nydegger Prospect—No. 178 on Map II.

On north side of Mill Creek 5.0 miles southwest of Mill Creek town; **Hughes Ferry Coal**; elevation, 2840′ B.

				Ft.	In.
1.	Soil and sandy shale				
2.	**Coal**, bony	0′	8″		
3.	Slate, bony	0	7		
4.	**Coal**, bony	0	11	2	2
5.	Shale, dark, pavement				

The above opening had been barely faced up and the true character of the coal was difficult to determine.

Coal Exposure—No. 179 on Map II.

On west side of Mill Creek 0.9 mile southwest of Glade Run and 7.5 miles southwest of Mill Creek town; **Hughes Ferry Coal**; elevation, 2895′ B.

		Ft.	In.
1.	**Sandstone, Nuttall**, shaly	25	0
2.	**Shale, Upper Iaeger**, dark, 1′ to	5	0
3.	**Coal**, good	2	0
4.	Shale, sandy, with abundant plant fossils, to creek	5	0

Coal Exposure—No. 180 on Map II.

On west side of Mill Creek 0.7 mile north of Meatbox Run and about 7.8 miles southwest of Mill Creek town; **Hughes Ferry Coal**; elevation, 2960′ B.

		Ft.	In.
1.	**Sandstone, Nuttall**, flaggy and shelving		
2.	**Coal**	2	0
3.	Shale, dark, with plant fossils, to creek, visible	5	0

In the portion of Huttonsville District covering part of the valley of Shavers Fork of Cheat the Hughes Ferry Coal has been noted at the following diamond drill borings:

West Virginia Pulp & Paper Co. 1A (50)	2′	2″	
West Virginia Pulp & Paper Co. No. 4 (53)	3′	6″	(slaty)
West Virginia Pulp & Paper Co. No. 5 (54)	9′	8″	(slaty)
West Virginia Pulp & Paper Co. No. 8A (58)	1′	7″	
West Virginia Pulp & Paper Co. No. 9 (60)	0′	9″	
West Virginia Pulp & Paper Co. No. 12 (63)	2′	1″	

At No. 8A (58) the core showed a laminated streak of coal and bone, three inches thick, at the top, followed by 1′ 4″ of clean coal. A sample of the entire seam was analyzed on a moisture-free basis by chemists of the company, as follows:

	Per cent.
Volatile Matter	22.32
Fixed Carbon	61.35
Ash	16.33
Sulphur	0.60
B. T. U.	12,865

A few exposures and prospects have been observed in this territory as follows:

West Virginia Pulp & Paper Company Exposure—No. 181 on Map II.

On north side of Whitmeadow Run 0.7 mile above mouth and 3.7 miles north of Cheat Bridge; Hughes Ferry Coal; elevation, 3570′ B.

			Ft.	In.
1. Sandstone, Nuttall, massive, pebbly			30	0
2. Concealed and slate			10	0
3. Coal, soft	1′	10″		
4. Slate, black	0	4		
5. Coal, thickness concealed	?		2	2

As noted in the Cheat Bridge Section, page 167, the West Virginia Pulp & Paper Company Prospect (No. 182 on Map II), along the Staunton and Parkersburg Pike on the eastern side of White Top Mountain 0.7 mile northwest of Cheat Bridge at elevation 3860′ B., had fallen shut but according to H. F. Cromer, land agent of the company, the coal measured 4′ 4″ thick at outcrop but pinched down to 1′ 6″ farther in the mountain.

The following prospect had fallen shut when visited by the writer, its section being reported by H. F. Cromer:

West Virginia Pulp & Paper Company Prospect—No. 183 on Map II.

On Cheat Mountain south of Cromer Top and three miles northwest of Cheat Bridge; Hughes Ferry Coal; elevation, 4030′ B.

			Ft.	In.
1. Coal	0′	8″		
2. Slate, very hard	0	2		
3. Coal, clean	1	8		
4. Bone	0	4		
5. Coal	0	6	3	4

According to Mr. Cromer coal from this opening was formerly carried away for blacksmithing purposes for which it bore a good reputation.

The **West Virginia Pulp & Paper Company Prospect (No. 184 on Map II)**, on the north side of Lambert Run 2.3 miles southwest of Cheat Bridge at elevation 3955′ B., had fallen shut when visited by the writer. According to Mr. Cromer it measured 1′ 6″ thick and was formerly carried away for blacksmithing.

Hughes Ferry Coal, Mingo District.

In Mingo District, the Hughes Ferry Coal has been prospected or observed at a few localities. The Valley Head Section, page 171, notes its blossom in the State road on the eastern end of Point Mountain at elevation 3715′ B. The **Ward & Hutton No. 1 (67) Coal Test Boring** records it as 2′ 2″ thick and their **No. 3 (68)** gives it as 0′ 6″. The following prospect, not far from the Randolph County line, has been made in recent years:

Elkins & Strader Prospect—No. 185 on Map II.

Fork Lick District, Webster County; in a ravine of Back Fork of Elk River 1.2 miles northeast of Waneta; **Hughes Ferry Coal**; elevation, 2900′ B.

	Ft.	In.
1. Shale, sandy, visible	3	0
2. **Coal**, soft, good	4	2
3. Fire clay shale, pavement		

The **West Virginia Pulp & Paper Company Prospect (Paris Green Opening)— No. 186 on Map II**, in Fork Lick District, Webster County, on a branch of Bergoo Creek 2.1 miles southwest of Whitaker Falls, measured 1′ 0″ of coal at elevation 3410′ B.

Hughes Ferry Coal, Dry Fork District.

In Dry Fork District the Hughes Ferry Coal has been opened at various points and apparently offers the prospect of furnishing minable coal in most of the region of its outcrop. Several openings have been made along or near Otter Creek, partly in Tucker and partly in Randolph County, as follows:

Otter Creek Boom & Lumber Company Exposure—No. 187 on Map II.

Dry Fork District, Tucker County; on west side of Dry Fork one mile northwest of Otter; **Hughes Ferry Coal**; elevation, 2845′ B.

		Ft.	In.
1.	Sandstone, Nuttall, cliff	20	0
2.	Shale, Upper Iaeger, sandy, dark, with fire clay	15	0
3.	Coal	0	6
4.	Shale, pavement	0	6

Otter Creek Boom & Lumber Company Exposure—No. 188 on Map II.

Dry Fork District, Tucker County; on Coal Run of Otter Creek 1.2 miles southwest of Otter; **Hughes Ferry Coal**; elevation, 2775′ B.

		Ft.	In.
1.	Shale, Upper Iaeger, dark, sandy	24	0
2.	Coal, soft	0	11
3.	Fire clay shale		

Otter Creek Boom & Lumber Company Prospect—No. 189 on Map II.

Dry Fork District, Randolph County; on Possession Camp Run 0.5 mile south of Tucker County line; **Hughes Ferry Coal**; elevation, 2780′ B.

				Ft.	In.
1.	Shale, Upper Iaeger, dark, sandy, with numerous plant fossils			5	0
2.	Coal, medium-hard	0′	6″		
3.	Coal, soft	1	1	1	7
4.	Fire clay shale, ferruginous, to creek				

A sample (No. 428R) was collected from Nos. 2 and 3 of section, the composition of which is published under **Mine No. 189** in the Table of Coal Analyses at the end of this Chapter. The analysis reveals a very pure coal, exceptionally low in ash, sulphur, and phosphorus.

Otter Creek Boom & Lumber Company Mine—No. 190 on Map II.

Dry Fork District, Randolph County; on west side of Otter Creek 0.4 mile south of Devils Gulch; **Hughes Ferry Coal**; elevation, 3000′ B.

	Ft.	In.
Fallen shut, coal reported 2′ 6″ to	3	2

At the above opening the coal was once mined for railroad fuel by the Otter Creek Boom & Lumber Company but the operation was abandoned when timber hauling ceased along the creek. The old opening had entirely fallen shut, its thickness being reported by Adam Phillips, guide. A sample (No. 426R) was collected from an old stock pile at the base of the incline, the composition of which is published under Mine No. 190 in the Table of Coal Analyses at the end of this Chapter. The analysis shows 27.49 per cent. of ash, indicating the rapid deterioration of the coal when exposed to the air, this figure being nearly ten times as high as the sample from Mine No. 189 in the same valley. A comparison of the two analyses reveals the fact that the only essential difference is in fixed carbon, indicating the oxidation of that constituent.

Otter Creek Boom & Lumber Company Mine—No. 191 on Map II.

Dry Fork District, Randolph County; on east side of Otter Creek, 0.2 mile north of Harper Run; Hughes Ferry Coal; elevation, 3040′ B.

		Ft.	In.
1. Shale, Upper Iaeger, dark, sandy		3	0
2. Coal	1′ 2″		
3. Concealed by water (coal?)	1 2	2	4

A small operation once existed at the above locality but it has been abandoned for many years.

Otter Creek Boom & Lumber Company Prospect, Reger Opening—No. 192 on Map II.

Dry Fork District, Randolph County; on east side of Otter Creek 0.6 mile southwest of Harper Run; Hughes Ferry Coal; elevation, 3050′ B.

	Ft.	In.
1. Shale, gray		
2. Coal, soft, good	2	0
3. Shale, gray, pavement		

The above prospect was made by A. G. Raines and the writer, being dug back merely far enough to face up the coal.

On the waters of Shavers Fork only a few prospects have been made in the Hughes Ferry in Dry Fork District, the following being all that were observed:

Ward & Triplett Prospect—No. 193 on Map II.

On Middle Point west of Taylor Run, 2.4 miles northeast of Bowden; Hughes Ferry Coal; elevation, 3250′ B.

	Ft.	In
1. Sandstone, visible, in place?	1	0
2. Shale, dark	0	2
3. Coal	1	0
4. Fire clay shale, pavement?		

This place was not well faced up and there was considerable doubt whether the full thickness of the coal was revealed.

Farther south the Thompson Coal Company Prospect (No. 194 on Map II), on the west side of Shavers Mountain 1.1 miles northeast of Bemis at elevation 3445′ B., had fallen shut, being reported as 2′ 10″ thick by Isaac Helmick, of Flint, who made it.

In the Stony River Basin southeast of Laneville no Hughes Ferry prospects have been made, so far as known, but this coal appears to be fairly good on the south side of the Roaring Plains in Pendleton County and hence it is considered probable that it should be present on the Randolph County side of the line. On the Pendleton County side, as will be explained in more detail in the discussion of the Sewell Coal in connection with a revision of the Long Run of Roaring Creek Section on a later page of this Chapter, it is the belief of the writer that a coal found by Dr. John L. Tilton at elevation 4197′ B., four miles north of Onego and about 1½ miles west of the mouth of Long Run, is the Hughes Ferry. This is described as being 2′ 7″ thick with 0′ 6″ of poor coal at the top and 2′ 1″ of good coal at the bottom. A sample (No. T. L. 18) was collected by Dr. Tilton at the outcrop, the composition of which is reported as follows by Kaplan:

	Per cent.
Moisture (sample as received)	2.80
Volatile Matter	17.40
Fixed Carbon	60.70
Ash	19.10
Total	100.00
Sulphur	0.32

Quantity of Hughes Ferry Coal Available.

The following table, compiled from planimetric measurements of the areas indicated on Figure 26 and Map II by R. C. Tucker and Geo. W. Grow, shows the probable amount of Hughes Ferry Coal in the county:

Probable Amount of Hughes Ferry Coal.

Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal. (2000 lbs.)
Roaring Creek	2	36.40	23,296	2,029,547,520	81,181,901
Middle Fork	2	146.75	93,920	8,182,310,400	327,292,416
New Interest	1	0.45	288	12,545,280	501,811
Leadsville	1	0.05	32	1,393,920	55,757
Beverly	1½	7.60	4,864	317,813,760	12,712,550
Valley Bend	1½	16.10	10,304	673,263,360	26,930,534
Huttonsville	1½	29.00	18,560	1,212,710,400	48,508,416
Mingo	2	25.375	16,240	1,414,828,800	56,593,152
Dry Fork	1½	29.375	18,800	1,228,392,000	49,135,680
Totals		291.10	186,304	15,072,805,440	602,912,217

CASTLE COAL.

The Castle Coal, previously discussed in Chapter VI, page 264, has a considerable development in the southwestern part of the county and also along the North Potomac Syncline in the valley of Shavers Fork of Cheat. Generally it is soft and columnar in structure, single- or double-bedded, and of variable thickness, ranging from one to three feet. It appears to be medium-high in volatile matter, low in sulphur and ash, and high in the fusing point of its ash. It has not been mined commercially but has been opened at various points for local domestic use. Figure 27 shows the areas within which it should eventually produce a considerable amount of fuel. Its outcrop is not indicated on Map II, but its position about midway between the Hughes Ferry and Sewell fixes its position fairly well on the map.

Castle Coal, Roaring Creek District.

In Roaring Creek District the Castle Coal is noted in the Norton Section, page 130, being 2′ 8½″ thick and slaty. It is also recorded in the **Maxwell and Crawford No. 2 (2) Coal Test Boring** in the present Chapter, being only 0′ 8″ thick.

It has been opened at a few points in the gap of Rich Mountain, as follows:

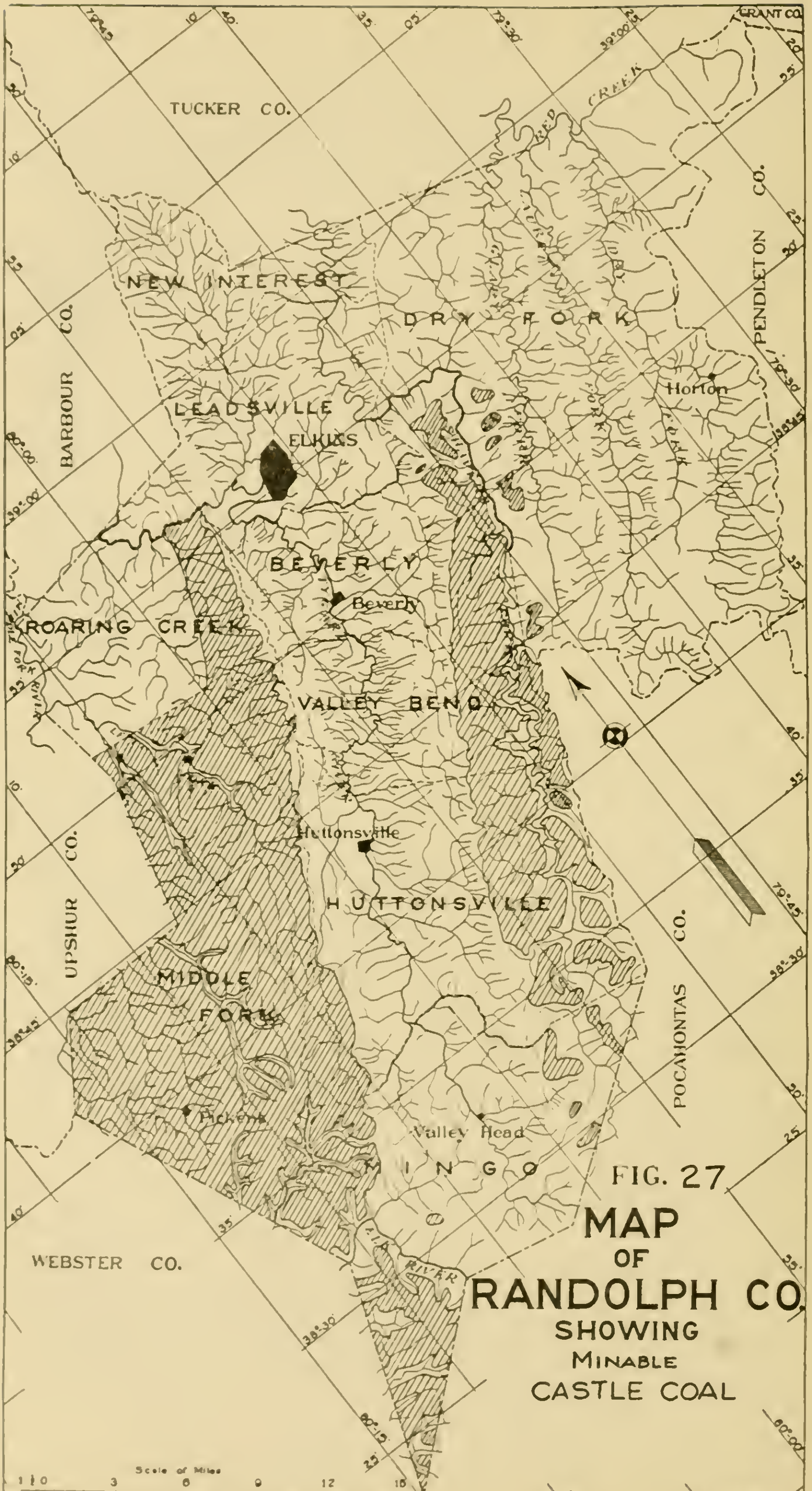


FIG. 27

MAP OF RANDOLPH CO. SHOWING MINABLE CASTLE COAL

Claude W. Maxwell Prospect—No. 197 on Map II.

On north end of Rich Mountain facing Tygart River 0.7 mile southwest of Aggregates; Castle Coal; elevation, 2060′ B.

			Ft.	In.
1. Coal, reported	1′	0″		
2. Bone, reported	1	0		
3. Coal, reported	1	0	3	0

The above opening had fallen shut when visited by the writer, its thickness being reported by Mr. Maxwell.

Claude W. Maxwell Prospect—No. 198 on Map II.

On north end of Rich Mountain facing Tygart River 0.6 mile southwest of Aggregates; Castle Coal; elevation, 2110′ B.

			Ft.	In.
1. Sandstone, massive				
2. Shale, Sandy Huff, sandy			4	0
3. Coal, reported	1′	0″		
4. Bone, reported	1	0		
5. Coal, reported	1	2	3	2

This opening, also, had fallen shut, its thickness being reported from memory by Mr. Maxwell.

Castle Coal, Middle Fork District.

In Middle Fork District the Castle Coal is noted in the measured sections of Chapter V, as follows: Laurel Branch of Middle Fork Section, 1′ 0″; Adolph Section, 2′ 0″ thick, and slaty; Hartridge Section, 0′ 8″; Helvetia Section, 1′ 0″. It is also noted in coal test borings in the present Chapter as follows: Cassity Fork Boom & Lumber Company No. 2 (17), 0′ 5″; Womelsdorff Heirs No. 12 (19), 2′ 4″ thick, and slaty; Elkhorn Coal Corporation No. 4 (28), 0′ 3″; Elkhorn Coal Corporation No. 5 (29), 0′ 3″.

At Prospect No. 199 on Map II, on Long Run of Middle Fork River 0.3 mile west of Loda, the coal was opened at elevation 2520′ B., but the place had fallen shut and could not be measured. At Prospect No. 200 on Map II, on Middle Fork River just west of Cassity, it was opened at elevation 2180′ B., but the place had fallen shut, the thickness of the coal being reported by Reuben Zirkle as slightly over two feet. The J. A. Long Prospect (No. 201 on Map II), on Middle Fork River just southwest of Cassity at elevation 2180′ L., had fallen partly shut, there being one foot of coal visible and the total thickness being reported as two feet.

The coal is reported by Teets at Prospect No. 202 on

Map II, on Left Fork of Right Fork of Buckhannon River, 1.6 miles northeast of Pickens, with a thickness of 1′ 3″ and an elevation of 2510′ B. On the Back Fork of Elk River the coal was once opened at the **Holly Lumber Company Prospect** (**No. 203 on Map II**), on Zimmerly Run 1.8 miles south of the Parting Springs, with a thickness of 1′ 11″ and an elevation of 3070′ B.

Castle Coal, Leadsville District.

In Leadsville District, the following prospect was once opened by John Gaither, of Elkins:

Susan Darby Prospect—No. 204 on Map II.

On the south end of Laurel Ridge facing Tygart River; **Castle Coal**; elevation, 2365′ B.

			Ft.	In.
1. Shale, dark				
2. **Coal**	1′	3″		
3. Shale, dark-gray	1	3		
4. **Coal**	1	3	3	9
5. Concealed by mud and water, pavement?				

The Castle Coal is not known to occur farther north in Laurel Ridge and hence it is not regarded as probable that any appreciable amount of it will be recovered in Leadsville District.

Castle Coal, Beverly District.

In Beverly District the Castle Coal has been opened at a few points in Cheat Mountain, as follows:

Walkers New River Mining Company Prospect (W. L. Camden Land)—No. 205 on Map II.

On east side of Cheat Mountain facing Shavers Fork, 0.6 mile southwest of Montes; **Castle Coal**; elevation, 3016′ B.

	Ft.	In.
1. Shale, dark	4	0
2. **Coal**, soft, rotten	2	2
3. Shale, pavement, concealed, etc., to base of **Sewell Coal**	80	0

A sample (No. 731R) was collected from No. 2 of section, the composition of which is published under **Mine No. 205** in the Table of Coal Analyses at the end of this Chapter.

The **Davis Coal Land Company Prospect** (**No. 206 on Map II**), on the north side of Fishinghawk Creek 0.8 mile west of Bemis, measured 1′ 6″ of clean coal at elevation 2900′ B.

Castle Coal, Valley Bend District.

In Valley Bend District the Castle Coal has not been prospected, so far as known, but there should be practically the same quality of coal as in Beverly and Huttonsville Districts.

Castle Coal, Huttonsville District.

In Huttonsville District west of Tygart Valley the Castle Coal is recorded in the **Ward & Hutton No. 2 (66) Coal Test Boring** as 1′ 8″ thick. At the **Lincoln Currence Prospect (No. 207 on Map II)**, on the east side of Rich Mountain, facing Right Fork of Mill Creek 2.2 miles northwest of Mill Creek town, it was opened at elevation 3065′ B. and showed a total thickness of 9′ 7″, but contained several streaks of shale, as detailed in the Mill Creek Section, page 164. Several exposures were noted along Mill Creek as follows:

Coal Exposure—No. 208 on Map II.

On west side of Mill Creek 0.1 mile above Glade Run and 6½ miles southwest of Mill Creek town; **Castle Coal**; elevation, 2790′ B.

	Ft.	In.
1. **Shale, Sandy Huff**, dark, with iron carbonate nodules	15	0
2. **Coal**, good, soft	1	1
3. Fire clay shale, sandy	5	0
4. Sandstone, in creek		

Coal Exposure—No. 209 on Map II.

On west side of Mill Creek 0.4 mile above Glade Run and about 6½ miles southeast of Mill Creek town; **Castle Coal**; elevation, as below.

	Ft.	In.
1. **Shale, Sandy Huff**, sandy	5	0
2. **Coal**, good (2805′ B.)	1	4
3. Fire clay shale, sandy	5	0
4. **Coal**	0	2
5. Fire clay shale, sandy, with plant roots	10	0
6. **Coal**, good (2788′ B.)	1	6
7. Shale, dark, with abundant plants	2	0
8. Sandstone, massive		

No. 2 of the above exposure is identical with No. 2 of Exposure No. 208 by direct tracing. It appears evident that the same split as found in Mine No. 207 on Rich Mountain still continues on Mill Creek. In No. 7 of Exposure No. 209 there is visible the round hole where a beautiful Sigillaria once stood upright, but which has been entirely carbonized and almost entirely washed away, leaving only the cortical impressions in the fire clay. This tree measured 1′ 9½″ in diameter and the extensions of two main roots branching at angles of about 40° from the vertical may be traced for three feet or more.

Coal Exposure—No. 210 on Map II.

On west side of Mill Creek 0.5 mile above Glade Run and about 6.7 miles southwest of Mill Creek town; Castle Coal; elevation, 2805′ B.

				Ft.	In.
1.	Shale, sandy, with iron concretions			25	0
2.	Coal			0	8
3.	Shale, sandy, with iron concretions			5	0
4.	Coal			1	4
5.	Shale, dark, sandy			6	0
6.	Coal			1	2
7.	Shale. dark			3	0
8.	Coal, hard	2′	0″		
9.	Slate, black, bony	0	3		
10.	Coal	0	3		
11.	Slate, black, cannel bone	1	3		
12.	Coal	0	1		
13.	Fire clay shale, dark	1	0		
14.	Coal, somewhat bony	0	10	5	8
15.	Fire clay shale, with plant fossils			5	0
16.	Sandstone, in creek				

From the basal exposures at this point it is evident that Nos. 8-14 of section represent the same coal as No. 6 of Exposure No. 209.

Coal Exposure—No. 211 on Map II.

On Mill Creek, 0.7 mile above Glade Run and about 7 miles southwest of Mill Creek town; Castle Coal; elevation, 2820′ B.

				Ft.	In.
1.	Coal	1′	6″		
2.	Slate, black	0	4		
3.	Coal, cannel bone	1	3	3	1
4.	Fire clay shale, in creek				

In the above exposure the relationship to the section at Exposure No. 210 is evident from the position of the cannel bone.

In the portion of Huttonsville District covering part of the valley of Shavers Fork there have been no surface openings in the Castle Coal, so far as known, but several diamond drill borings have found it, as published in earlier pages of this Chapter. These borings are as follows:

West Virginia Pulp & Paper Co. No. 1A (50)	0′ 6″	
West Virginia Pulp & Paper Co. No. 5 (54)	1′ 10″	(slaty)
West Virginia Pulp & Paper Co. No. 8A (58)	0′ 10″	
West Virginia Pulp & Paper Co. No. 8B (59)	0′ 6″	
West Virginia Pulp & Paper Co. No. 9 (60)	1′ 1″	
West Virginia Pulp & Paper Co. No. 12 (63)	1′ 1″	(bony)
West Virginia Pulp & Paper Co. No. 13 (64)	2′ 6″	(slaty)
West Virginia Pulp & Paper Co. No. 14 (65)	1′ 11″	

The core from No. 8A (58) was analyzed on a moisture-free basis by chemists of the company, as follows:

	Per cent.
Volatile Matter	20.64
Fixed Carbon	64.71
Ash	14.65
Sulphur	5.19
B. T. U.	13,000

Naturally, the analysis of a ten-inch streak of coal in which there were probably included particles of bone at the top and bottom gives little evidence on the quality at localities where the bed may be thicker.

Castle Coal, Mingo District.

In Mingo District west of Tygart Valley the Castle Coal is recorded in the **Ward & Hutton No. 1 (67) Coal Test Boring** as 2′ 0″ thick, with a binder. In the **No. 3 (68)** of the same property it is noted as 2′ 1″ thick. The following mine has recently been opened for local domestic use:

Davis & Elkins Farm Mine (Geo. B. Swecker Opening)—No. 212 on Map II.

Along State road at eastern end of Point Mountain 2.1 miles west of Monterville; **Castle Coal**; elevation, 3640′ B.

	Ft.	In.
1. **Sandstone, Harvey,** massive	30	0
2. **Coal,** medium-hard, columnar, good	3	0
3. Shale, pavement		

A sample (No. 692R) was collected from a stock pile at the dump, the composition of which is published under **Mine No. 212** in the Table of Coal Analyses at the end of this Chapter. The analysis shows that the coal is low in ash and sulphur and high in fusing point of ash.

So far as known there have been no prospects in the

Castle Coal in the portion of the county south of Elk River, but as the thickness and purity of the New River coals generally increase to the southward its thickness and quality in that region should be equal to the results found north of Elk River.

In the portion of Mingo District covering the head of the valley of Shavers Fork no prospects have been made in the Castle Coal, so far as known, but presumably the coal would have about the same thickness and character as in the adjacent part of Huttonsville District farther north.

Castle Coal, Dry Fork District.

In Dry Fork District the Castle Coal is exposed or has been opened at a few points in the valleys of Otter Creek and Shavers Fork and it was once prospected in Allegheny Mountain east of Dry Fork. At the **Otter Creek Boom & Lumber Company Exposure (No. 213 on Map II)**, in Dry Fork District, Tucker County, on Coal Run of Otter Creek 1.2 miles southwest of Otter Station, it is visible at elevation 2750′ B., as detailed in the Otter Creek Section, page 197, being 1′ 2″ thick, with 0′ 3″ of slate at the middle. At the **Ward & Triplett Prospect (No. 214 on Map II)**, on Middle Point, facing Taylor Run of Shavers Fork 2.4 miles northeast of Bowden, it was opened at elevation 3200′ B., showing 1′ 5″ of clean coal. At the **Thompson Coal Company Prospect (No. 215 on Map II)**, on the eastern side of Shavers Mountain facing Shavers Fork 0.9 mile northeast of Bemis, it was opened at elevation 3350′ B., but the place had fallen shut, there being 2′ 10″ of clean coal according to Isaac Helmick who made the prospect.

In the Job Syncline east of Dry Fork the Castle Coal was once opened at the **Warren Cunningham Prospect (No. 216 on Map II)**, just beneath the top of Job Knob 1.8 miles northeast of Job at elevation 4380′ B., as indicated in the Job Knob Section, page 207. This place had fallen shut, but, according to Guy Cunningham, showed 2′ 0″ of coal.

In the Stony River Basin it has not been found, so far as known, and it is therefore doubtful whether any quantity may be recovered in this part of the county.

Quantity of Castle Coal Available.

The following table, compiled by Tucker and Grow from close estimates of the areas indicated on Figure 27, as made possible by the outcrops of adjacent coals on Map II, shows the probable amount of minable Castle Coal in the county:

Probable Amount of Castle Coal.

Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal. (2000 lbs.)
Roaring Creek ----	1½	15.15	9,696	633,536,640	25,341,465
Middle Fork -----	2	151.00	96,640	8,419,276,800	336,771,072
Beverly ----------	1½	8.80	5,632	367,994,880	14,719,795
Valley Bend ------	1½	19.70	12,608	823,806,720	32,952,269
Huttonsville ------	1½	37.95	24,288	1,586,977,920	63,479,117
Mingo ------------	1½	31.20	19,968	1,304,709,120	52,188,365
Dry Fork --------	1½	3.00	1,920	125,452,800	5,018,112
Totals --------		266.80	170,752	13,261,754,880	530,470,195

SEWELL (SHARON) COAL.

The Sewell (Sharon) Coal, previously discussed in Chapter VI, page 271, is generally present in those portions of Randolph County where its horizon belongs. It apparently becomes too thin for mining, however, in the northwestern corner of Roaring Creek District, and there are other localities where it is too thin or impure to be of value, as is the case with many other coals and as is particularly true of the coals in the New River Group. The outcrop of this coal is delineated on Map II and in the territory west of Tygart Valley, south of Elk River, and along the North Potomac (Georges Creek) Basin its position with respect to sea-level is indicated by green structure contours. Figure 28 shows its supposed minable extent, but detailed sections and measurements for any locality should be consulted before the beginning of mining operations.

Commercial mining in this seam in the county has been in continuous progress only since 1917, but the coal has long been an economic factor, having been mined on Rich Mountain for local use in Tygart Valley before the advent of railroads and before the exploitation of other coals began, and having been mined for brief periods at many openings of a temporary nature along the lines of various lumber railroads on Buckhannon River, Back Fork of Elk, Mill Creek, and other localities. Within the last few years its active operation on Shavers Fork and on Mill Creek has begun, and the coal has met with high favor on account of its great purity and general excellence for steaming and metallurgical purposes.

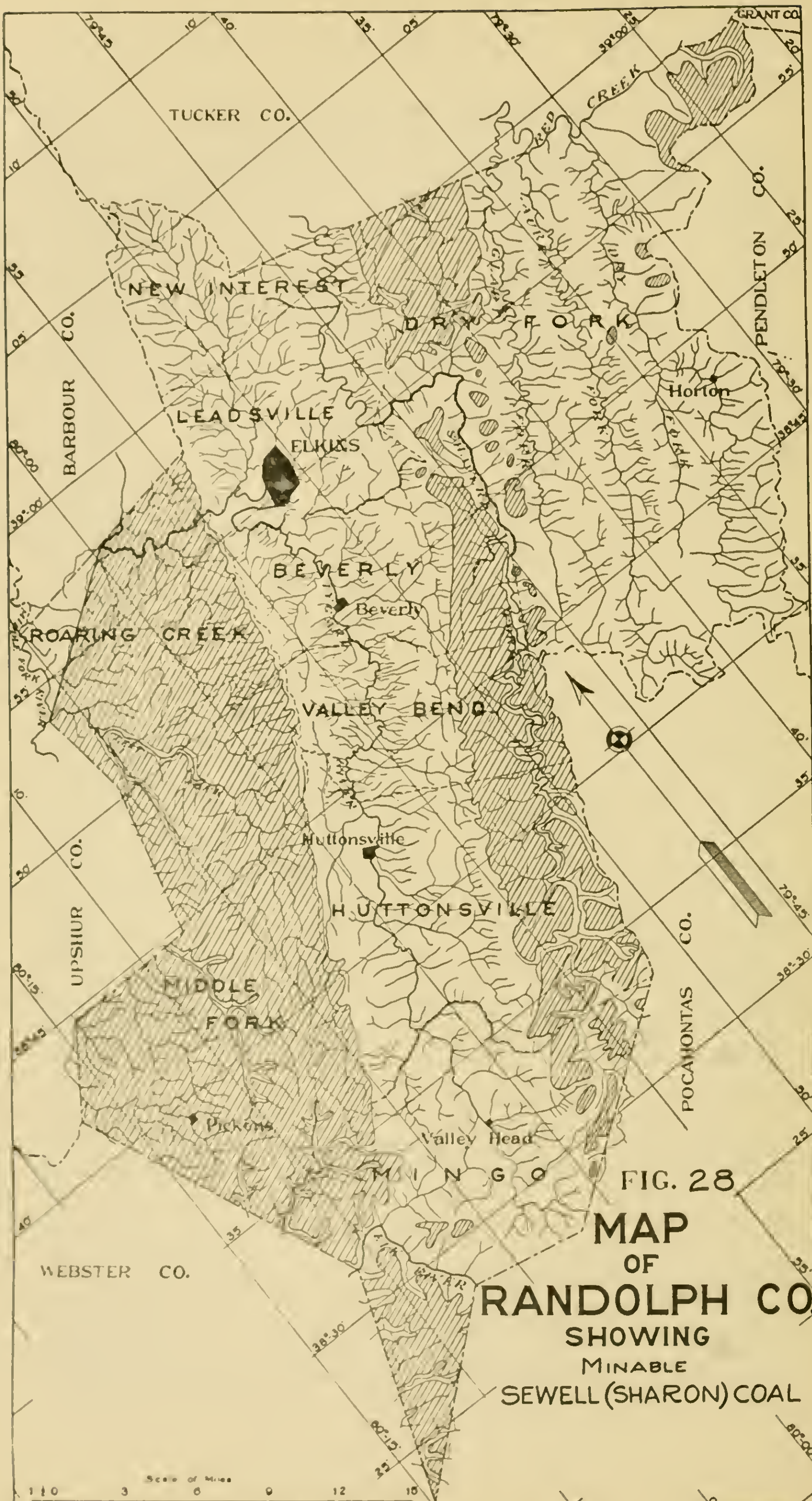


FIG. 28
MAP
OF
RANDOLPH CO.
SHOWING
MINABLE
SEWELL (SHARON) COAL

The thickness of the Sewell varies from two to five feet at most localities where it is indicated as minable. Generally there is a streak of bony coal at the base, varying from 0′ 6″ to 1′ 0″, which must be discarded in mining and which is usually left in place when additional head room is not required. The remainder of the seam is usually clean coal except on the upper waters of Shavers Fork and in the valley of Mill Creek where a bony parting separates it into two benches. At most localities it is very low in ash and sulphur and high in British thermal units and in the fusing point of its ash. Its volatile content west of Tygart Valley is medium-high and in the Shavers Fork Valley medium-low. In the former territory it seldom goes above 30 per cent. and in the latter it is seldom below 20 per cent. In B. T. U. it often exceeds 15,000 and in fusing point of ash it is usually in excess of 2700° F. and often approaches 3000° F. Naturally the presence of such a large acreage of superior coal of this character indicates a long period of successful coal mining in Randolph County.

Sewell (Sharon) Coal, Roaring Creek District.

In Roaring Creek District the Sewell Coal is apparently of no value in the northwestern corner and there is doubt as to its minable thickness in the Belington Syncline beneath the immediate valley of Roaring Creek. In Rich Mountain, however, and farther south toward the Middle Fork District line, there is a large body of good coal. In Chapter V in the Norton Section, page 130, records it as 2′ 8½″ thick, and slaty. In the present Chapter the **Maxwell & Crawford No. 2 (2) Coal Test Boring** notes it as 1′ 6″ thick, and bony. In the **West Virginia Coal & Coke Company No. —— (4) Coal Test Boring**, it is reported 3′ 5″ thick, the detailed record not having been secured. In the **P. J. Cain No. 1 (13) Coal Test Boring** it is only 0′ 11″ thick, with a binder. Certain other borings in the district did not go deep enough to reach it, and the records of still others which may have penetrated it were not secured.

At the northern end of Rich Mountain several openings have been made in the gap of Tygart River, and the region immediately southward, as follows:

Claude W. Maxwell Prospect, Arnold & Williams Opening—No. 232 on Map II.

At the base of Rich Mountain on south side of Tygart River 0.8 mile west of Aggregates; **Sewell Coal**; elevation, 1900′ B.

		Ft.	In.
1. Sandstone, massive, coarse			
2. Shale, Hartridge, dark, sandy, roof		1	6
3. Coal, soft, good	1′ 0″		
4. Slate, bony	1 0	2	0
5. Fire clay shale, gray, with plant roots and a little foliage			

Claude W. Maxwell Farm Mine—No. 233 on Map II.

On north end of Rich Mountain facing Tygart River 0.5 mile west of Aggregates; Sewell Coal; elevation, 2065′ B.

		Ft.	In.
1. Sandstone, massive			
2. Coal, soft, good	2′ 2″		
3. Slate, bony	0 6	2	8
4. Fire clay shale, gray, hard			

A sample (No. 740R) was collected from No. 2 of section, the composition of which is published under Mine No. 233 in the Table of Coal Analyses at the end of this Chapter.

The Claude W. Maxwell Farm Mine, Geo. Harper Opening (No. 234 on Map II), on the western slope of Rich Mountain 0.8 mile south of Aggregates at elevation 2660′ B., had fallen shut when visited by Teets, but the clean coal bench is reported by Mr. Maxwell as 2′ 2½″ to 2′ 4″ thick.

Claude W. Maxwell Prospect—No. 235 on Map II.

On the eastern slope of Rich Mountain on the head of Friend Run of Roaring Creek 2.5 miles southeast of Norton; Sewell Coal; elevation, 2790′ B.

		Ft.	In.
1. Sandstone, roof			
2. Coal, medium-soft	3′ 2″		
3. Slate, bony	0 2	3	4
4. Shale, gray, with plant roots			

The Claude W. Maxwell Prospect (No. 236 on Map II), on the western slope of Rich Mountain two miles northeast of Coalton at elevation 2980′ B., had fallen shut when visited by the writer, but according to Charles Scott, coal prospector, of Mabie, about two feet of the coal blossom was uncovered without reaching a roof.

In the vicinity of the Staunton and Parkersburg Pike the coal has been mined extensively for local domestic use, much of it having been hauled to Tygart Valley. In this region the following mines and prospects were noted:

Grace Hart Johnson Prospect, Chas. Scott Opening—No. 237 on Map II.

On Laurel Run of Roaring Creek south of Staunton and Parkersburg Pike and 2.2 miles east of Fisher; Sewell Coal; elevation, 2750' B.

			Ft.	In.
1. Soil				
2. Coal, soft, good	5'	0"		
3. Bone, mostly concealed by water	1	4	6	4

Grace Hart Johnson Farm Mine, John Hart Opening—No. 238 on Map II.

On south side of Staunton and Parkersburg Pike 2.4 miles east of Fisher; Sewell Coal; elevation, 2860' B.

			Ft.	In.
1. Shale, Hartridge, dark, sandy				
2. Shale, dark-gray, with plant fossils			1	0
3. Coal, medium-hard, good	3'	9"		
4. Coal, bony	1	2	4	11
5. Shale, gray, pavement				

A sample (No. 735R) was collected from this opening, the composition of which is published under Mine No. 238 in the Table of Coal Analyses at the end of this Chapter. At this opening, which is operated by John Hart, the coal is being actively mined, being trucked to Tygart Valley and elsewhere for local use.

A sample (No. 736R) of the bottom bony coal, No. 4 of section, shows the following analysis, according to Kaplan:

	Per cent.
Moisture	0.74
Volatile Matter	24.13
Fixed Carbon	56.44
Ash	18.69
Total	100.00
Sulphur	0.49
B. T. U.	12,270
Fusing Point of Coal Ash	2900° F.

From the dark-gray shale, No. 2 of section, Dr. David White and the writer collected Fossil Lot 412, from which Mariopteris inflata, Sphenophyllum cuneifolium, Alethopteris grandifolia, Neuropteris sp., and Whittlesia elegans were identified on the ground.

The Grace Hart Johnson Prospect (No. 239 on Map II), just north of the Parkersburg and Staunton Pike 2.6 miles east of Fisher at elevation 2990′ B., had fallen shut many years ago, no report on its thickness being obtained.

Grace Hart Johnson Farm Mine—No. 240 on Map II.

On Rich Mountain, at the head of Laurel Run, 2.8 miles southeast of Fisher; Sewell Coal; elevation, 3010′ B.

			Ft.	In.
1. Slate, black				
2. Coal, soft, with streaks of mineral charcoal	3′	10″		
3. Slate, black, bony	1	0	4	10
4. Slate, pavement				

A sample was collected from No. 2 of section, the composition of which is published under Mine No. 240 in the Table of Coal Analyses at the end of this Chapter. This mine has now been abandoned, but for many years prior to the beginning of commercial mining in the county and before the advent of railroads it was the principal source of domestic coal for Beverly and the adjacent portion of Tygart Valley.

The coal was once opened at Prospect No. 241 on Map II, on a branch of Laurel Run 2.3 miles southeast of Fisher at elevation 2700′ B., but the place had fallen shut and could not be measured.

Several openings have been made on the 2800-acre tract known as the Taylor George property and now reported to be owned by steel interests, of Youngstown, Ohio, and lying just south of the Grace Hart Johnson property. Some years ago a railroad was graded from Roaring Creek up Laurel Run with the intention of starting commercial operations but apparently the collapse of the coal market in recent years caused the enterprise to be abandoned. These openings, so far as observed, are as follows:

Taylor George No. 1 Mine—No. 242 on Map II.

On north side of Laurel Run of Roaring Creek 2.1 miles southeast of Fisher; Sewell Coal; elevation, 2800′ B.

	Ft.	In.
1. Shale, dark	2	0
2. Coal, clean, soft	3	8
3. Shale, gray, pavement		

A sample (No. 669R) was collected from this opening, the composition of which is published under Mine No. 242 in the Table of Coal Analyses at the end of this Chapter. It is of interest to note that no bony coal appears at the base of the seam at this point.

The Taylor George Farm Mine (No. 243 on Map II), on the north side of Laurel Run of Roaring Creek 2.2 miles southeast of Fisher at elevation 2850′ B., measured 3′ 9″ of clean, soft coal.

Taylor George Farm Mine—No. 244 on Map II.

On north side of Laurel Run of Roaring Creek 2.3 miles southeast of Fisher; **Sewell Coal**; elevation, 2925′ B.

		Ft.	In.
1.	Soil		
2.	**Coal**, soft, good	4	0
3.	Fire clay shale, pavement, visible	3	0

In the Middle Fork River region of Roaring Creek District the two following openings were noted:

Farm Mine—No. 245 on Map II.

On Middle Fork River, at the mouth of Long Run, 2.4 miles north of Long; **Sewell Coal**; elevation, 1900′ B.

				Ft.	In.
1.	Sandstone, massive				
2.	**Coal**, soft	1′	10″		
3.	Slate, black	0	1		
4.	**Coal**, soft	1	7	3	6
5.	Slate, pavement, and concealed, to Long Run			5	0

Farm Mine No. 246 on Map II, on Long Run two miles north of Long at elevation 1910′ L., had fallen shut and could not be measured.

Sewell (Sharon) Coal, Middle Fork District.

In Middle Fork District there have been many openings in the Sewell (Sharon) Coal, partly along Rich Mountain and partly along the Hiram Anticline on the waters of Middle Fork and Buckhannon Rivers. It has also been tested at numerous diamond drill borings elsewhere so that the information as to its thickness is fairly complete. It is being actively mined on Middle Fork River and was formerly mined on Left Fork of Buckhannon while lumber operations were in progress.

In Chapter V it is recorded in the Lost Run of Middle Fork Section as 3′ 0″ thick; in the Lick Run of Middle Fork Section as 3′ 0″ thick; in the Cassity Section as 3′ 2″ thick, with a slaty base; in the Laurel Branch of Middle Fork Section as 2′ 1″ thick, with a sandstone split; in the Adolph Section as 2′ 7″ thick, and slaty; and in the Hartridge Section as 2′ 4″ thick. The diamond drill borings of the present Chapter report it as follows:

Cassity Fork Boom & Lumber Co. No. 1 (16)	0′ 3″	
Cassity Fork Boom & Lumber Co. No. 2 (17)	1′ 0″	
Cassity Fork Boom & Lumber Co. No. 3 (18)	1′ 8″	
Womelsdorff Heirs No. 12 (19)	4′ 1½″	
Elkhorn Coal Corporation No. 2 (23)	7′ 11″	(slaty)
Elkhorn Coal Corporation No. 3 (27)	1′ 11″	
Elkhorn Coal Corporation No. 4 (28)	3′ 8″	(parting)
Elkhorn Coal Corporation No. 5 (29)	2′ 2″	
Elkhorn Coal Corporation No. 7 (31)	2′ 8″	
Elkhorn Coal Corporation No. 8 (32)	3′ 0″	
Elkhorn Coal Corporation No. 2 (26)	3′ 1″	

Several openings have been made on the waters of Middle Fork River, the following having been noted on Long Run:

Elijah Newlon Farm Mine—No. 247 on Map II.

On Long Run, 0.7 mile north of Long; **Sewell Coal**; elevation, 2045′ B.

			Ft.	In.
1. Sandstone				
2. Coal, soft	2′	8″		
3. Coal, bony	0	4	3	0
4. Concealed to Long Run				

The three following openings are reported by Teets:

Hartford Newlon Farm Mine—No. 248 on Map II.

On Long Run, 0.6 mile west of Long; **Sewell Coal**; elevation, 2065′ B.

			Ft.	In.
1. Sandstone				
2. Coal	2′	8″		
3. Coal, bony	0	4	3	0

Ira Shockey Farm Mine—No. 249 on Map II.

On Long Run, at Long; **Sewell Coal**; elevation, 2120′ B.

			Ft.	In.
1. Sandstone				
2. Coal, soft	3′	0″		
3. Coal, bony	0	6	3	6
4. Slate, pavement				

A sample was collected from this opening, presumably from No. 2 of section, the composition of which is published under Mine No. 249 in the Table of Coal Analyses at the end of this Chapter.

J. A. Enlow Farm Mine—No. 250 on Map II.

On Long Run, 0.4 mile north of Loda; Sewell Coal; elevation, 2300′ B.

				Ft.	In.
1.	Sandstone, massive, roof, visible			5	0
2.	Coal, soft	2′	7″		
3.	Coal, bony	0	10	3	5
4.	Slate, pavement				

A sample was collected from this opening, presumably from No. 2 of section, the composition of which is published under Mine No. 250 in the Table of Coal Analyses at the end of this Chapter.

The coal was once opened at Prospect No. 251 on Map II, on Long Run, at Loda, with an elevation of 2380′ B., but the place had fallen shut and could not be measured.

On Middle Fork River several openings have been made in the vicinity of Cassity, the following having been noted:

Moore-Keppel & Company Prospect—No. 252 on Map II.

On Middle Fork River, 1.2 miles northwest of Cassity; Sewell Coal; elevation, 2115′ B.

				Ft.	In.
1.	Slate, dark				
2.	Coal, soft	2′	10″		
3.	Slate, bony, visible	0	6	3	4

At the following opening the coal was formerly mined for railroad, steam, and domestic fuel by Moore-Keppel & Company for its various lumber operations:

Moore-Keppel & Company Prospect—No. 253 on Map II.

On Middle Fork River, 0.8 mile northwest of Cassity; Sewell Coal; elevation, 2040′ B.

				Ft.	In.
1.	Sandstone, massive, visible			10	0
2.	Coal, soft	2′	6″		
3.	Coal, bony	1	0	3	6
4.	Slate, pavement				

A sample was collected from No. 2 of section, the composition of which is published under Mine No. 253 in the Table of Coal Analyses at the end of this Chapter.

The Frank Phares Prospect (No. 254 on Map II), on Middle Fork River, 0.7 mile northwest of Cassity at elevation 2055′ B., had fallen shut and could not be measured.

R. O. Zirkle Farm Mine—No. 255 on Map II.

On Middle Fork River, 0.5 mile northwest of Cassity; **Sewell Coal**; elevation, 2030′ B.

			Ft.	In.
1. Sandstone, massive			10	0
2. **Coal**, soft	2′	7″		
3. **Coal**, bony	0	8	3	3
4. Slate, pavement				

A sample was collected from No. 2 of section at this opening, the composition of which is published under **Mine No. 255** in the Table of Coal Analyses at the end of this Chapter.

At the extreme head of Cassity Fork the coal comes to the surface near the crest of Rich Mountain where the two following openings were found:

Clarence (?) Lutz Prospect—No. 256 on Map II.

On a branch of Cassity Fork, 4.5 miles east of Cassity; **Sewell Coal**; elevation, 3005′ B.

			Ft.	In.
1. Slate, dark			10	0
2. **Coal**, soft	4′	0″		
3. **Coal**, bony	1	2	5	2
4. Slate, pavement				

The **J. W. Pingley Prospect (No. 257 on Map II)**, on the same branch of Cassity Fork 4.6 miles east of Cassity at elevation 3050′ B., had fallen shut and could not be measured, its thickness being reported as more than 9 feet. It is quite probable that the measurement was taken at a point where the bed stood at a considerable angle, as this thickness is much greater than was observed at any other opening.

The following mine was noted by Teets near the summit of Rich Mountain, on another branch of Cassity Fork:

William D. Currence Farm Mine—No. 258 on Map II.

On Panther Run of Cassity Fork, 4.7 miles southeast of Cassity; **Sewell Coal**; elevation, 3035′ B.

			Ft.	In.
1. Sandstone, massive			6	0
2. **Coal**	2′	6″		
3. **Coal**, bony	0	8	3	2
4. Slate, pavement				

A sample was collected from this opening, presumably from No. 2 of section, the composition of which is published under **Mine No. 258** in the Table of Coal Analyses at the end of this Chapter.

In 1926 the writer visited this opening and measured a slightly different section, possibly in another part of the mine, as follows:

				Ft.	In.
1.	**Sandstone, Lower Guyandot**, white, with a few small quartz pebbles			10	0
2.	**Coal**, soft, columnar	3′	0″		
3.	Bone	0	8	3	8
4.	Fire clay shale, gray, with abundant plant roots				

On Three Forks Run, slightly south of, and above, Cassity the coal has now been mined commercially since 1917 by the Three Fork Coal Company, one of the early openings of which shows the following section:

Three Fork Coal Company Mine—No. 259 on Map II.

On Middle Fork River at the mouth of Three Forks Run 0.5 mile southwest of Cassity; **Sewell Coal**; elevation, 2040′ B.

				Ft.	In.
1.	**Sandstone, Lower Guyandot**, gray, hard, coarse			10	0
2.	Shale, dark			0	4
3.	**Coal**, good	3′	1″		
4.	**Coal**, bony	0	9	3	10
5.	Shale, hard, sandy, pavement				

Before commercial mining began this opening was known as the **A. J. Long Farm Mine**, being formerly listed and described in the Barbour, Upshur, and Western Randolph Report of the Survey, page 719, under **Mine No. 1061.**

The main operation of the company is now slightly farther up the run, the following information having been obtained by the writer in 1927:

Three Fork Coal Company, Cassity Mine—No. 260 on Map II.

On Three Forks Run of Middle Fork River, 0.7 mile southwest of Cassity; **Sewell Coal**; elevation, 2070′ B.

				Ft.	In.
1.	Sandstone, massive				
2.	Slate, black, bony			0	2
3.	**Coal**, soft	2′	7″		
4.	**Coal**, bony, 0′ 8″ to	1	0	3	7
5.	Sandstone, pavement				

"Principal office, Ellamore, W. Va.; daily capacity, 150 tons; 18 miners and 11 laborers employed; electric haulage; coal partly shipped east for steam and domestic use and partly used in local lumber operations; greatest rise, northwest; sample (No. 739R) collected from No. 2 of section in Room No. 4, off First Right; R. J. Tillson, Superintendent, authority for mine data."

The composition of the above sample is published under **Mine No. 260** in the Table of Coal Analyses at the end of this Chapter.

Before commercial mining began this opening was known as the **A. J. Long Farm Mine,** being formerly listed and described in the Barbour, Upshur, and Western Randolph Report of the Survey, page 719, under **Mine No. 1062.**

The thin streak of dark, bony shale or slate lying over the coal at these two openings contains many plant fossils, and many tons of the material now lie on the mine dump from which the writer collected **Fossil Lot 436** which was shipped to Dr. David White at Washington. No list has been received from Dr. White, but on the ground the writer recognized **Calamites, Lepidodendron, Sigillaria,** and numerous ferns, some of which may have been **Mariopteris** and others **Annularia?**

Some valuable chemical tests, principally of the Sewell Coal near Cassity, have been made for Claude W. Maxwell, of Elkins, and others; and through the courtesy of Mr. Maxwell these have been placed at the disposal of the Survey, the results, as previously published in the Barbour, Upshur, and Western Randolph Report but with mine numbers revised to conform to the serials of the present Report, being as follows:

Tests of Sewell Coal from Three Fork Coal Company Mine (No. 259) at mouth of Three Forks Run, near Cassity.

Analysis.

	Per cent.
Moisture	1.18
Volatile Matter	27.80
Fixed Carbon	65.12
Ash	5.90
Total	100.00
Sulphur	0.67
Phosphorus	0.032

Pittsburgh Testing Laboratory,
Lab. No. 38853. (Signed) Jas. O. Handy, Chief Chemist.

Coking Test.

Where Coked—Mt. Hope Coke Co. oven, Fayette Co., Pa.
Type of coal charged—5" by 30" rectangular.
Amount charged—ten tons.
Depth of coal in coke oven—2 ft. 4 in.
Time of burning—48 hours.
Depth of coke in oven—2 ft. 6 in.
Appearance of coke when made—Good, firm, and with silvery lustre.
Method of drawing coke—Pushing ram.

Disposition of coke to push—More readily than Connellsville coke.
Combustion action in oven—Coal inclined to expand slightly to side walls of oven, fissured well in coking, general action good.
Debris of breeze attendant—Perceptibly less than Connellsville coke.
Size of coke—Fairly passive, considerable horizontal fracture in structure.
Condition of coke oven—Good.
Heated condition of oven previous to charging—Low: Coal charged in oven Tuesday, March 4th, after a 72-hour charge had been drawn, consequently oven would be at lowest temperature.
Remarks:

As the Superintendent of Mt. Hope Coke Company had no previous experience with the coking of this class of coal, the methods in service for coking Connellsville coals were adhered to throughout and without the slightest deviation therefrom, the wisdom of which is shown in the result obtained. It is probable that the regulation of air when the coal was burning would have produced even more favorable results, but under the condition, experiment could not be resorted to, and at least this test has established the fact that New River coal of the quality coked has made a good record.

Analysis of Coke.

	Per cent.
Moisture	0.18
Volatile Matter	0.62
Fixed Carbon	90.78
Ash	8.42
Total	100.00
Sulphur	0.52
Phosphorus	0.012
Crushing strength, 1" cube, by pounds	3.940
Specific gravity	1.71
Apparent specific gravity	.914
Per cent. of cells by volume	46.74
CC in 100 grams	51.33

Analysis No. 29331. The Metallurgical Laboratory,
Pittsburgh, Pa., March 15, 1913. (Signed) Jos. J. Miller, Mgr.

Remarks:

The coal from which this coke was manufactured had an unusual and effective mixing, as follows: I.—Mined. II.—Loaded in mine car. III.—Dumped from mine car to platform. IV.—Loaded from platform into wagons and hauled to railroad car. V.—Unloaded from wagons into car. VI.—Shoveled back in car. VII.—Unloaded and reloaded into second railroad car at Belington, W. Va. VIII.—Unloaded from car on to ground at Mt. Hope, Pa. IX.—Reloaded into wagon and hauled to mine cars. X.—Unloaded into mine cars. XI.—Dumped from mine cars into Charging Larry. XII.—From Larry into Coke oven.

By-Product Coking Test.

Formation and Series—Middle Pottsville. Series XII.
Coal Vein—Fire Creek No. 8 or Beckley No. 9 (Sewell, D. B. R.).
Size of coal vein—48 to 50 inches.
Appearance of coal vein—Good, a shining black coal.

Foreign mixture of strata—No strata, some thin shale at top of coal vein. No material affecting coal.
Roofing of coal vein—Sandstone. Clay mixed at top of vein.
Situation—Middle Fork River, Randolph County, W. Va.

Proximate Analysis.

	Per cent.
Moisture	29.10
Fixed Carbon	68.00
Ash	2.90
Total	100.00
Sulphur	0.80

Distillation Yield.

	Per cent.
Tar	4.116
Free Ammonia (NH_3)	0.270
Combined Ammonia (NH_3)	0.048
Water	4.511
Carbon Dioxide (CO_2)	0.845
Sulphuretted Hydrogen (H_2S)	0.204
Gas by weight	13.794
Total Volatile Matter	23.788
Coke Yield	76.212
Coke Yield by much (?)	72.780
Ammonia as Sulphate — Free	1.080
Ammonia as Sulphate — Combined	0.192
Ammonia as Sulphate — Total	1.272

Equivalents per net ton of coal:

Cubic feet of Gas—0°C, No. 0, (Hg. Dry, excl. CO_2 & H_2S. 8990 Incl 9187. (15°C, 3) Hg. Sat., excl. CO_2 & H_2S 9546 Incl. 9858.

Practical Yield.

Gallons of tar	5.4
Pounds of Sulphate	18.0

Alan Wood Iron and Steel Company Report on Coals along Middle Fork River, Randolph County, April 28, 1914.

Mine No. on Map II.	261	129	258	259
Coal Seam.	Sewell	Eagle	Sewell	Sewell
Name of Mine.	E. E. Shiflett.	Lloyd Zickefoose.	W. D. Currence.	Three Fork Coal Co.
Location.	Laurel Branch.	Three Forks.	Head of Cassity.	Mouth of Three Forks.
Sample No.	1842	1843	1844	1845
Volatile Matter	29.75	31.55	30.20	27.60
Fixed Carbon	67.90	65.65	64.97	65.90
Ash	3.35	3.00	4.83	6.50
Sulphur	0.618	0.717	0.894	0.824

The following opening is reported by Teets:

Arthur Shiflett Farm Mine—No. 261 on Map II.

On Laurel Branch of Middle Fork River, 3.2 miles northeast of Adolph; Sewell Coal; elevation, 2600' B.

				Ft.	In.
1.	Sandstone, massive, roof				
2.	Coal, soft	1'	11"		
3.	Coal, bony	1	2	3	1
4.	Slate, pavement				

A sample, presumably from No. 2 of section, was collected from this opening, the composition of which is published under Mine No. 261 in the Table of Coal Analyses at the end of this Chapter.

The two following openings have been made on the same branch in recent years:

Nestor Shiflett Farm Mine—No. 262 on Map II.

On north side of Laurel Branch of Middle Fork River 3.3 miles northeast of Adolph; Sewell Coal; elevation, 2695' B.

				Ft.	In
1.	Sandstone, massive				
2.	Shale, 0' 2" to			1	0
3.	Coal, soft, good	1'	5"		
4.	Coal, bony, interlaminated with gray shale	2	7	4	0
5.	Shale, gray, pavement				

Charles E. Daniels Farm Mine—No. 263 on Map II.

On south side of Laurel Branch of Middle Fork River three miles northeast of Adolph; Sewell Coal; elevation, 2655' B.

				Ft.	In.
1.	Sandstone, massive				
2.	Coal, good	2'	6"		
3.	Coal, bony	0	4	2	10
4.	Fire clay shale, dark			3	0

On the waters of Buckhannon River several openings have been made, one of which Teets reports as follows on the waters of Right Fork:

Emil Metzner Farm Mine—No. 264 on Map II.

On Saltlick Run of Left Fork of Right Fork of Buckhannon River, 1.7 miles southeast of Helvetia; Sewell Coal; elevation, 2405' B.

				Ft.	In.
1.	Slate				
2.	Coal, soft	1′	7″		
3.	Slate, gray, hard	0	1		
4.	Coal, soft	0	9		
5.	Shale, gray	0	1		
6.	Coal, hard, bony	0	6	3	0
7.	Slate, pavement				

A sample was collected from this opening, presumably from the two benches of clean coal, the composition of which is published under **Mine No. 264** in the Table of Coal Analyses at the end of this Chapter.

On Left Fork the following prospect, examined by Teets, is the most northern exposure noted on this branch:

Elkhorn Coal Corporation Prospect—No. 265 on Map II.

On Left Fork of Buckhannon River, 1 mile southwest of Star; Sewell Coal; elevation, 2690′ B.

				Ft.	In.
1.	Sandstone, gray, visible			5	0
2.	Slate, dark, with iron ore nodules			4	0
3.	Coal, soft	1′	11″		
4.	Slate, gray	0	1		
5.	Coal, bony	0	10	2	10
6.	Slate, pavement				

Farther up the same fork the coal was mined commercially from 1911 to 1914 by the Rich Mountain Coal Company at Beech Run and Hartridge, but when the property was acquired by other interests both mines were abandoned and their entrances sealed with concrete barriers, making it impossible to enter them and secure sections and samples. The following measurement was made at the entrance to the old Beech Run Mine:

Elkhorn Coal Corporation, Beech Run Mine—No. 266 on Map II.

On Beech Run, at Beech Run village; Sewell Coal; elevation, 2690′ B.

				Ft.	In.
1.	Coal, rotten, Sewell "B"			2	4
2.	Shale, dark, soft			1	0
3.	Shale, dark, harder, with numerous plant fossils			8	0
4.	Coal, soft, columnar	2′	7″		
5.	Coal, bony	0	3 Sewell	2	10
6.	Slate, pavement				

Another old opening on the same run is reported as follows by Teets:

Elkhorn Coal Corporation, Beech Camp Mine—No. 267 on Map II.

On Beech Run, 1.6 miles south of Beech Run village; Sewell Coal; elevation, 2760' B.

		Ft.	In.
1. Slate			
2. Coal, soft	3' 0"		
3. Coal	0 6	3	6
4. Slate, pavement			

A sample was collected from this opening, presumably from No. 2 of section, the composition of which is published under **Mine No. 267** in the Table of Coal Analyses at the end of this Chapter.

The **Elkhorn Coal Corporation, Hartridge Mine—No. 268 on Map II**, on Left Fork of Buckhannon at elevation 2735' B., where the coal was formerly mined on a commercial basis by the Rich Mountain Coal Company, was sealed with concrete and no coal was visible at the outcrop, making it impossible to obtain a measurement. The **Daniel Tenney Farm Mine (No. 269 on Map II)**, on the west side of Left Fork of Buckhannon River at Hartridge with an elevation of 2735' B., had also fallen shut.

Several samples of the Sewell Coal were collected by Hart Brothers, of Clarksburg, former owners of the Rich Mountain Coal Company, from Buckhannon River and Rich Mountain, and were analyzed by the Survey, the results being published in Bulletin 2, pages 252-254 (1911). These analyses, together with the comment of Dr. I. C. White, are herein republished in full because they furnish the only available information on these closed mines:

"In recent months these New River coals have been opened for commercial shipments by the Rich Mountain Coal Co., owned principally by Hart Bros., of Clarksburg, along the line of the Alexander and Eastern Railway on the Left Fork of the Buckhannon River, in Randolph County. The following analyses of these New River coals from Randolph County, made in the Survey Laboratory, will give a good idea of their quality:

	1	2	3	4	5	6	7	Ave.
Moisture	0.57	0.80	0.93	1.33	0.56	0.87	0.73	0.83
Volatile Matter	29.89	29.40	29.07	30.77	27.14	31.01	26.27	29.08
Fixed Carbon	67.69	64.68	66.19	65.54	64.42	63.96	63.58	65.15
Ash	1.85	5.12	3.81	2.36	7.88	4.16	9.42	4.94
Totals	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Sulphur	0.91	0.71	0.98	0.58	1.52	0.58	0.73	0.86
Phosphorus	0.018	0.006	0.006	0.014	0.027	0.008	0.009	0.013
B. T. U.	15196				14489			

"Location of Samples.

No. 1. Coal (most probably Sewell) from Holland farm, Rich Mountain, Randolph County, W. Va.
No. 2. Beech Run Mine (No. 266 on Map II, D. B. R.), Rich Mountain Coal Co., Randolph County, W. Va.
No. 3. Tenney Mine (No. 268 or 269 on Map II, D. B. R.), Rich Mountain Coal Co., Randolph County, W. Va.
No. 4. 'Camp No. 11', Rich Mountain Coal Co., Randolph County, W. Va.
No. 5. Coal from old opening, top of Rich Mountain, near Elkins, Randolph County, W. Va.
No. 6. Hart Mine (No. 240 on Map II, D. B. R.), top of Rich Mountain, Randolph County, W. Va., near Beverly.
No. 7. Coal from old opening, top of Rich Mountain, near Elkins, Randolph County, W. Va.

"These analyses speak for themselves in revealing coals of great excellence. The volatile matter, it will be noted, is considerably higher than on New River, and the coal would certainly yield a coke of great purity.

"The ultimate analyses of samples 1 and 5 were also determined by Prof. Hite with the following results:

	1	5
Carbon	83.00	79.55
Hydrogen	5.48	5.41
Oxygen	7.32	4.46
Nitrogen	1.44	1.18
Sulphur	0.91	1.52
Ash	1.85	7.88
Totals	100.00	100.00
Calorimeter B. T. U.	15,196	14,489
Calculated B. T. U.	14,937	14,639

"The Rich Mountain Coal Company has built some beehive ovens to coke these New River coals at the head of the Left Fork of the Buckhannon River in Randolph County, and the results have proved very satisfactory, according to Messrs. Hart Bros., who report the analysis of their coke made by Messrs. Smith, Rudy & Co., of Philadelphia, as given below. A sample of this coke made at the Hartridge mine was also sent to the Survey office for analysis, and the results are given below:

	Analysis made by Smith, Rudy & Company.	Analysis made by W. Va. Geol. Survey.
Moisture	0.21	0.36
Volatile Matter	1.16	0.29
Fixed Carbon	93.71	92.68
Ash	4.92	6.67
Totals	100.00	100.00
Sulphur	0.83	0.82
Phosphorus	0.005	0.010

"These analyses reveal a coke of the very highest quality for metallurgical purposes, being very low in both ash and sulphur and high in fixed carbon, with most excellent cell structure and bright silvery lustre."

The Elkhorn Coal Corporation Prospect (No. 270 on Map II), at the junction of Morgan Camp and Phillips Camp Runs of Left Fork of Buckhannon 0.8 mile south of Hartridge at elevation 2755′ B., had fallen shut and its thickness could not be measured.

In that portion of Middle Fork District lying south of Pickens and drained by the waters of Sugar Creek and Back Fork of Elk River, only a few mines and prospects have been made in the Sewell, but these reveal a coal of high quality, the following having been noted:

Ranwood Lumber Company Exposure—No. 271 on Map II.

On Sugar Creek, 4.3 miles south of Pickens; Sewell Coal; elevation, 2575′ B.

	Ft.	In.
1. Sandstone, massive		
2. Shale, Hartridge, black	10	0
3. Coal, soft	2	0
4. Fire clay shale, gray, with plant fossils	3	0
5. Shale, dark, with ferriferous limestone, to creek	15	0

The following mine was opened in 1915 or 1916 on the Welsh Colony Tract to supply coal for the locomotives of the Ranwood Lumber Company on its narrow-gauge line to Pickens:

Ranwood Lumber Co., Welsh Colony Mine—No. 272 on Map II.

Holly District, Webster County; on Sugar Creek, 5 miles south of Pickens; Sewell Coal; elevation, 2550′ B.

	Ft.	In.
1. Sandstone, shaly		
2. Shale, sandy, dark	1	0
3. Coal, medium-soft	3	6
4. Slate, pavement		

A sample was collected from this place before the mine had been driven into the hill, the composition of which is published under Mine No. 272 in the Table of Coal Analyses at the end of this Chapter.

Another sample, collected by the lumber company farther under the hill and analyzed in the laboratory of the Survey, shows the following:

	Per cent.
Moisture	0.96
Volatile Matter	31.81
Fixed Carbon	62.44
Ash	4.79
Total	100.00
Sulphur	0.56

A sample of the coal from this mine, collected by Mr. A. W. Ewing, of Pickens, W. Va., and analyzed by the Sandusky Cement Company, of Cleveland, Ohio, yielded the following results, as reported by Wm. B. Newberry, Assistant Manager:

	Per cent.
Volatile Matter	29.73
Fixed Carbon	64.20
Ash	6.07
Total	100.00
Iron oxide in ash	3.72
Iron oxide in coal	0.23
Color of ash	light buff

The Middle Fork District line extends south as far as Back Fork of Elk River, practically all of this southern area being uninhabited and cut-over woodland where only a few coal prospects have been made. The two following openings were noted, one being just across the line in Webster County:

Coal Prospect—No. 273 on Map II.

Holly District, Webster County; on Back Fork of Elk River, 2 miles northeast of Waneta; Sewell Coal; elevation, 2700′ B.

			Ft.	In.
1.	Shale, dark, sandy			
2.	Coal, soft	3′ 10″		
3.	Coal, bony	0 6	4	4
4.	Fire clay shale, gray, with plant fossils		4	0

The gray fire clay shale, with numerous plant roots, is a typical feature of the Sewell Coal all the way through the Rich Mountain and Point Mountain region of Randolph County.

Coal Prospect—No. 274 on Map II.

On Hull Camp Run of Back Fork of Elk River, 2.8 miles northeast of Waneta; Sewell (?) Coal; elevation, 2820′ B.

		Ft.	In.
1.	Slate, black		
2.	Coal, hard, splinty	1	6
3.	Shale, sandy, visible	2	0

There is considerable doubt as to whether this prospect represents the Sewell Coal, as its thickness is not sufficient and it lacks the typical bony coal and the plant shale at the base. It might be that further prospecting would reveal the full thickness of the Sewell at this locality.

Mr. Lee A. Hamrick, of Waneta, according to his own report, once prospected this coal on Mitchell Run, finding a thickness of 3′ 0″. He also partially opened it on Zimmerly Run, where it shows the following:

Holly Lumber Company Prospect—No. 275 on Map II.

On Zimmerly Run of Back Fork of Elk River, 1.8 miles south of the Parting Springs; Sewell Coal; elevation, 2985′ B.

	Ft.	In.
1. Coal blossom, not opened up		
2. Sandstone, massive	5	0
3. Slate, black	4	0
4. Coal	1	6
5. Fire clay shale, to run	5	0

Sewell (Sharon) Coal, New Interest District.

In New Interest District, which forms the extreme northwestern part of the county, there is a fringe of Pottsville rocks along the crest of Laurel Ridge at the western line of the district, holding the horizon of the Sewell Coal in some of the higher tops but no prospects have been made, so far as known, and it is extremely doubtful if any good Sewell Coal exists. The eastern side of the district embraces a small part of McGowan Mountain east of Shavers Fork, where there should be a small acreage of coal. The following prospect was once opened in this territory:

Coal Prospect—No. 276 on Map II.

On west slope of McGowan Mountain facing Shavers Fork two miles southeast of Pettit; Sewell Coal; elevation, 3250′ B.

	Ft.	In.
1. Sandstone, pebbly		
2. Concealed	95	0
3. Sandstone, massive, pebbly, makes cliff	40	0
4. Concealed	65	0
5. Coal, thickness concealed, reported	4	0
6. Concealed, shale, and sandstone, to red beds	100	0

Mr. W. F. Lipscomb, of Parsons, is authority for the thickness of the coal, the prospect having fallen shut.

Sewell (Sharon) Coal, Leadsville District.

In Leadsville District a few openings in the Sewell (Sharon) Coal have been made in Laurel Ridge north of Tygart River, and in Rich Mountain south of the river, as follows:

L. L. Bennett Farm Mine, J. B. Ward, Jr., Opening—No. 277 on Map II.

Barker District, Barbour County; on Laurel Ridge just south of old Morgantown Pike 3.4 miles northwest of Gilman; **Sewell Coal;** elevation, 2697′ L.

				Ft	In.
1.	Slate, black, roof				
2.	**Coal**, soft	1′	7″		
3.	Shale, bony	0	5		
4.	**Coal**, soft	0	8	2	8

A sample (No. 655R) was collected from Nos. 2 and 4 of section, the composition of which is published under **Mine No. 277** in the Table of Coal Analyses at the end of this Chapter. This opening is on part of the property formerly known as the Camden 5,000-acre tract. The coal pitches westward at a steep angle but was mined for a time by Mr. Ward for the local trade.

The **Elkins Electric Railway Prospect (No. 278 on Map II)**, on the northern side of Tygart River 1.9 miles east of Norton, measured 2′ 8″ of clean coal, as noted in the Laurel Ridge Section, page 149.

The **Loyd Lantz (Martin Roy) Farm Mine (No. 279 on Map II)**, just east of the crest of Rich Mountain 0.7 mile south of Aggregates at elevation 2615′ B., had fallen shut when it was originally visited by Teets, being reported as having slightly less than three feet of coal, as noted in the Aggregates Section, pages 149-50. In later years it has been visited by the writer at various times but it still remains closed.

The **Susan Darby No. 1 (43) Coal Test Boring**, on the western slope of Laurel Ridge, records 2′ 0″ of Sewell Coal.

Sewell (Sharon) Coal, Beverly District.

In Beverly District there is a fine body of Sewell (Sharon) Coal in Cheat Mountain between Bowden and Bemis. In this part of the district the coal is generally covered by heavy drift and so far as known it remained undiscovered until prospecting was begun in 1925 or 1926 on the W.

L. Camden tract near Flint by the owner and Mr. J. D. Walker. In the latter season the writer began field work in this territory and opened the coal on the James Baker land at the western end of Pond Lick Mountain. Since that time prospecting has been continued and commercial mining has been begun by the Walkers New River Mining Company near Montes, and by the Davis Coal Land Company near Bemis and other localities, and the northern end of Pond Lick Mountain has been thoroughly prospected by W. D. Althouse, with results that indicate a large tonnage of good coal. The existing prospects and mines up to the close of the field season of 1927, so far as observed by the writer, or otherwise reported, are as follows:

Davis Coal Land Company Prospect—No. 280 on Map II.

On west side of Cheat Mountain, facing Right Fork of Files Creek 1.3 miles southeast of Millstone School; **Sewell Coal**; elevation, 3540′ B.; section and elevation reported by W. S. Brydon for the company.

	Ft.	In.
1. Soil		
2. **Coal**	1	11
3. Slate, black, pavement		

Davis Coal Land Company Prospect—No. 281 on Map II.

On west side of Cheat Mountain, facing Limekiln Run 1.6 miles south of Elkhorn School: **Sewell Coal**; elevation, 3380′ B.; section and elevation reported by the W. S. Brydon for the company.

	Ft.	In.
1. Soil		
2. **Coal**	3	2½
3. Slate, black, pavement		

The following prospect, on the same side of Cheat Mountain, did not have the appearance of having been fully driven to roof and pavement when visited by the writer in 1926:

Robert Criss Prospect—No. 282 on Map II.

On west side of Cheat Mountain in ravine just south of old county road on the waters of Left Fork of Files Creek 1.7 miles northeast of Elkhorn School; **Sewell Coal**; elevation, 3280′ B.

	Ft.	In.
1. Slate, black, visible	1	0
2. **Coal**, poorly exposed at outcrop	1	4
3. Shale, pavement		

In the same season Mr. E. D. Baker, of Beverly, started a prospect on his land immediately south of this ravine at elevation 3320′ B., but was apparently slightly too high on the mountain to find the coal. More recently it has been reported that the coal has been found in good thickness on this property, but, if so, the writer has unfortunately had no opportunity to visit the locality and examine it.

Davis Coal Land Company Prospect—No. 283 on Map II.

On west side of Cheat Mountain along or near old county road on a branch of Left Fork of Files Creek 1.7 miles northeast of Elkhorn School; Sewell Coal; elevation, 3320′ B.; section and elevation reported by W. S. Brydon for the company.

	Ft.	In.
1. Coal	2	0
2. Slate, black, pavement		

The following opening, made by the writer with the help of Frank Coberly and Wade Triplett in the autumn of 1926, and later revisited in the summer of 1927, revealed for the first time the good coal that exists in Pond Lick Mountain:

James Baker Prospect, Reger Opening—No. 284 on Map II.

On north side of Pond Lick Mountain facing Shavers Fork 1.6 miles southwest of Faulkner; Sewell Coal; elevation, 3690′ B.

			Ft.	In.
1. Shale, Hartridge, dark, with streaks of sandstone				
2. Coal, soft, columnar	3′	3″		
3. Slate, bony	0	6	3	9
4. Shale, gray, pavement				

A sample (No. 728R) was collected from No. 2 of section and 30 feet from the surface, the composition of which is published under Mine No. 284 in the Table of Coal Analyses at the end of this Chapter. This place is near the western rim of the basin, the coal having an eastward dip of 20°. Eastward into the basin the following openings have now been made by John Purkey, civil engineer, on the W. D. Althouse land which was acquired from K. T. Manning after the work was done:

W. D. Althouse Prospect, John Purkey Opening—No. 285 on Map II.

On north side of Pond Lick Mountain facing Shavers Fork 1.4 miles southwest of Faulkner; Sewell Coal; elevation, 3570′ B.

Fallen shut; thickness not learned.

W. D. Althouse Prospect, John Purkey Opening—No. 286 on Map II.

On north side of Pond Lick Mountain facing Shavers Fork at the head of Mike Run 1.3 miles south, slightly west, of Faulkner; Sewell Coal; elevation, 3545' B.

			Ft.	In.
1. Sandstone, massive				
2. Shale, Hartridge, dark, 1' to			2	0
3. Coal, soft	3'	2"		
4. Slate, black, bony	1	6	4	8
5. Shale, gray, pavement				

A sample (No. 727R) was collected from No. 3 of section, 75 feet from the outcrop, the composition of which is published under Mine No. 286 in the Table of Coal Analyses at the end of this Chapter.

W. D. Althouse Prospect, John Purkey Opening—No. 287 on Map II.

On north side of Pond Lick Mountain facing Shavers Fork 1.2 miles south of Faulkner; Sewell Coal; elevation, 3515' B.

About 3' 0" of coal visible but not driven to roof.

W. D. Althouse Prospect, John Purkey Opening—No. 288 on Map II.

On north side of Pond Lick Mountain facing Shavers Fork 1.1 miles south, slightly east, of Faulkner; Sewell Coal; elevation, 3515' B.

			Ft.	In.
1. Sandstone, massive				
2. Coal, soft	1'	0"		
3. Shale, dark, soft	0	1½		
4. Coal	0	3		
5. Shale, gray, 0' 1" to	0	7		
6. Coal, soft	3	0½		
7. Slate, bony	1	8	6	8

A sample (No. 726R) was collected from Nos. 2 and 6 of section, 20 feet from the outcrop, the composition of which is published under Mine No. 288 in the Table of Coal Analyses at the end of this Chapter. The strata included in Nos. 2-5 of this section together compose a roof or rider coal development that is visible at only a few localities in this basin, Nos. 6 and 7 being the usual section that is found.

On the southeastern slope of Pond Lick Mountain the following prospect indicates a continuation of the roof coal development:

Davis Coal Land Company Prospect, John Purkey Opening —No. 289 on Map II.

On southeast slope of Pond Lick Mountain north of Lower Pond Lick, 1.1 miles west of Weese Crossing; Sewell Coal; elevation, 3430′ B.

			Ft.	In.
1. Shale, Hartridge, dark			3	0
2. Coal	0′	2″		
3. Shale, gray	2	2		
4. Coal, soft, columnar	3	0		
5. Coal, bony	0	10	6	2
6. Shale, gray, pavement				

A sample (No. 729R) was collected from No. 4 of section, the composition of which is published under Mine No. 289 in the Table of Coal Analyses at the end of this Chapter.

On the western tributaries of Shavers Fork and the eastern slope of Cheat Mountain numerous openings have been made, the following having been noted:

Harness Kerns Prospect—No. 290 on Map II.

On Pond Lick Mountain west of Lower Pond Lick one mile northwest of Woodrow; Sewell Coal; elevation, 3380′ B.

			Ft.	In.
1. Shale, Hartridge, dark, not driven to solid roof				
2. Coal, soft	1′	6″		
3. Shale, dark	0	5		
4. Coal	0	4		
5. Shale, dark-gray	1	0		
6. Coal, soft	1	6		
7. Coal, bony	0	3	5	0

At the above opening Nos. 2-5 apparently represent the roof coal development.

W. L. Camden Prospect—No. 291 on Map II.

On north side of Red Creek one mile southwest of Flint; Sewell Coal; elevation, 3145′ B.

	Ft.	In
1. Shale, Hartridge, dark, with fossil ferns	5	0
2. Coal	1	3
3. Fire clay shale, with plant roots	1	0

At this opening the roof is not solid and there is doubt whether the full thickness of coal is exposed.

W. L. Camden Prospect, Isaac Helmick Opening—No. 292 on Map II.

On south side of Red Creek 1.1 miles southwest of Flint; **Sewell Coal**; elevation, 3120′ B.

			Ft.	In.
1. Shale, Hartridge, black, with fossil ferns				
2. Coal, reported 1′ 10″ to			2	0

The above opening had fallen shut, its thickness being reported by Mr. Helmick.

The **W. L. Camden Prospect (No. 293 on Map II)**, on the south side of Red Creek one mile southwest of Flint at elevation 3065′ B., had fallen shut, being reported by Mr. Helmick as less than 3′ 0″ thick but not driven to roof. A small fossil fish tooth was found in a fragment of Hartridge Shale on the dump.

W. L. Camden Prospect—No. 294 on Map II.

On south side of Red Creek one mile southwest of Flint; **Sewell Coal**; elevation, 3055′ B.

			Ft.	In.
1. Shale, Hartridge, dark			7	0
2. Coal, soft, good	3′	0″		
3. Bone, black	0	4	3	4
4. Fire clay shale, gray, with plant roots				

A sample (No. 718R) was collected from this opening, the composition of which is published under **Mine No. 294** in the Table of Coal Analyses at the end of this Chapter.

Walkers New River Mining Company, Big Sewell No. 1 Mine—No. 295 on Map II.

On Cheat Mountain facing Shavers Fork 0.7 mile southwest of Montes; **Sewell Coal**; elevation, 2936′ B.

			Ft.	In.
1. Shale, Hartridge, dark, with abundant plant fossils, and with Naiadites			10	0
2. Coal, soft, columnar	3′	4″		
3. Slate, black, bony	0	7	3	11
4. Shale, gray, with plant roots, pavement				

"Principal office, formerly Brisbin, Pa., now Elkins, W. Va.; coal owned by W. L. Camden et al.; daily capacity (in development stage); mule and pony haulage, but expect to build 200-K. W. electric plant; coal shipped east for steam, smithing, pottery, and metallurgical use; greatest rise, west; sample (No. 730R) collected in Main Heading, from No. 2 of section, 100 feet from outcrop; J. D. Walker, President, authority for mine data."

The composition of the above sample is published under Mine No. 295 in the Table of Coal Analyses at the end of this Chapter. This mine began shipping coal about August 1, 1927, the above data having been secured on August 11 before tonnage of any appreciable quantity had been developed. This is the first of the recent mines which have begun to ship commercial coal from the Cheat Mountain Coal Field.

At this mine both the Hartridge Shale and the under clay contain many beautiful fossil ferns, including Mariopteris inflata and other species. Fossil Lot 403 was collected from the dump by Dr. David White and the writer and shipped to Washington.

W. L. Camden Prospect—No. 296 on Map II.

On Bonelick Branch of Shavers Fork 0.8 mile southwest of Montes; Sewell Coal; elevation, 2935′ B.

			Ft.	In.
1. Shale, Hartridge, dark			4	0
2. Coal, soft, columnar	2′	10″		
3. Coal, bony	0	7	3	5
4. Shale, pavement				

W. L. Camden Prospect—No. 297 on Map II.

On Bonelick Branch of Shavers Fork one mile southwest of Montes; Sewell Coal; elevation, 2935′ B.

Not completed to good roof; about 2′ 0″ of coal visible with bone at base.

W. L. Camden Prospect—No. 298 on Map II.

On Bonelick Branch of Shavers Fork 1.1 miles southwest of Montes; Sewell Coal; elevation, 2950′ B.

			Ft.	In.
1. Shale, Hartridge, dark			7	0
2. Coal, soft, columnar	2′	7″		
3. Coal, bony	0	4	2	11
4. Shale, pavement				

A sample (No. 711R) was collected from No. 2 of section, the composition of which is published under Mine No. 298 in the Table of Coal Analyses at the end of this Chapter. This prospect, like most of the others on the Camden land, was made by the Walkers New River Mining Company.

On the north side of Fishinghawk Creek west of Bemis, several prospects in the Sewell Coal have been made by the Davis Coal Land Company under the general supervision of Mr. John T. Davis and under the active charge of Mr. W. S.

Brydon; and commercial mining is now in active progress. These openings and mines, most of which were examined in 1927 but some of which were visited as late as February, 1929, are as follows:

Davis Coal Land Company Prospect—No. 299 on Map II.

On north side of Fishinghawk Creek 0.5 mile west of Bemis; **Sewell Coal**; elevation, 2875' B.

			Ft.	In.
1. Shale, dark-gray				
2. **Coal**, soft, good	2'	8"		
3. Bone	0	2	2	10
4. Shale, gray, pavement				

Davis Coal Land Company, No. 1 Mine—No. 300 on Map II.

On north side of Fishinghawk Creek 0.8 mile west of Bemis; **Sewell Coal**; elevation, 2820' B.

			Ft.	In.
1. Shale, dark				
2. **Coal**, soft	2'	11"		
3. **Coal**, hard, bony	0	4	3	3
4. Shale, gray, pavement				

"Principal office, Elkins, W. Va.; daily capacity, 35 to 40 tons; 8 miners and 4 laborers employed; coal goes east and west for general purposes; pony haulage; sample (No. 775R) collected by David B. Reger from No. 2 of section, in Main Heading, 700 feet from outcrop; W. S. Brydon, Superintendent, authority for mine data."

The composition of the above sample, practically on an air-dried basis, is reported as follows by Kaplan:

		Per cent.
Moisture		0.35
Volatile Matter		20.42
Fixed Carbon		74.47
Ash		4.76
Total		100.00
Sulphur		0.64
B. T. U.	14,825	
Fusing Point of Ash	2,440° F.	

Another section of this mine, measured only 30 feet from the outcrop, showed the following:

			Ft.	In.
1. **Shale, Hartridge**, dark			10	0
2. **Coal**, soft, columnar	3'	8"		
3. **Coal**, bony	0	10	4	6
4. Shale, dark-gray, pavement				

A sample (No. 754R) was collected from No. 2 of section at this point, the composition of which is published under Mine No. 300 in the Table of Coal Analyses at the end of this Chapter. By inadvertence no ultimate analysis of the sample taken at the face (No. 775R) was made and hence it has been necessary to use the earlier sample in the table.

Davis Coal Land Company Prospect—No. 301 on Map II.

On north side of Fishinghawk Creek 0.9 mile west of Bemis; Sewell Coal; elevation, 2815′ B.

			Ft.	In.
1.	Soil			
2.	Coal, soft, rotten	3′ 1″		
3.	Coal, bony	0 9	3	10
4.	Fire clay shale, gray, pavement			

Davis Coal Land Company Prospect—No. 302 on Map II.

On north side of the south fork of Fishinghawk Creek 0.1 mile southwest of the forks and 1.1 miles west of Bemis; Sewell Coal; elevation, 2840′ B.

		Ft.	In.
1.	Shale, Hartridge, dark		
2.	Coal, partly concealed, reported by W. S. Brydon	2	10

Davis Coal Land Company Mine—No. 303 on Map II.

On north side of the south fork of Fishinghawk Creek 0.2 mile southwest of the forks and 1.1 miles west of Bemis; Sewell Coal; elevation, 2840′ B.

			Ft.	In.
1.	Shale, Hartridge, dark, with abundant plant fossils		5	0
2.	Slate, dark, bony		0	2
3.	Coal, soft, good	2′ 11″		
4.	Coal, bony	0 3	3	2
5.	Shale, gray, pavement, and concealed		15	0
6.	Sandstone, Welch, massive, poorly exposed		15	0
7.	Coal, Welch, 0′ 0″ to		0	3
8.	Fire clay shale, and sandy shale		5	0
9.	Sandstone, Upper Raleigh (Sharon), somewhat weathered, to creek bed		5	0

A sample (No. 753R) was collected from No. 3 of section, 15 feet from the outcrop, the composition of which is published under Mine No. 303 in the Table of Coal Analyses at the end of this Chapter. When this examination was made, late in the fall of 1927, this opening was being driven with the idea of starting a mine but farther in the hill the coal thinned considerably and the project was abandoned or deferred.

Nos. 5-9 of this section indicate quite clearly the relationship of the Sewell Coal to the underlying Upper Raleigh (Sharon) Sandstone in this region and also show the Welch Coal and other intermediate strata.

Sewell (Sharon) Coal, Valley Bend District.

In Valley Bend District the Sewell (Sharon) Coal is found in good development in Cheat Mountain southward from Bemis and Fishinghawk Creek along the North Potomac (Georges Creek) Syncline, and is now being mined commercially. The following developments had taken place before field work was concluded in this territory:

West Virginia Pulp & Paper Company Prospect, Monsarrat Opening—No. 304 on Map II.

On south side of Fishinghawk Creek 0.7 mile west of Bemis; Sewell Coal; elevation, 2845′ B.

Fallen shut, thickness not learned.

Monsarrat & Company, Inc., Mine—No. 305 on Map II.

On south side of Fishinghawk Creek 0.9 mile west of Bemis; Sewell Coal; elevation, 2840′ B.

				Ft.	In.
1.	Shale, dark, slickensided				
2.	Slate, black, soft, bony			0	4
3.	Coal, good, soft	3′	2″		
4.	Coal, bony	0	2	3	4
5.	Shale, gray, pavement				

"Principal office, 803 Atlas Building, Columbus, Ohio; coal owned by West Virginia Pulp & Paper Company; daily capacity, 100 tons; 11 miners and 10 laborers employed; electric haulage with power furnished by 150-K. W. plant; coal principally shipped east for general purposes; greatest rise, southeast; sample (No. 774R) collected from No. 3 of section in Second East Main, 500 feet east of Main Haulway; A. H. Campbell, Superintendent, authority for mine data."

The composition of this sample, which was taken February 11, 1929, is as follows:

	Per cent.
Moisture	0.44
Volatile Matter	22.95
Fixed Carbon	69.06
Ash	7.55
Total	100.00
Sulphur	0.55
B. T. U.	14,315

The above sample appears to have come from the edge of a small area of comparatively high-ash coal which was encountered in some of the workings at this time. In August, 1927, when the mine had been driven only 30 feet under cover and when the coal still showed an excess of surface moisture, the following measurement was made at the face:

	Ft.	In.
1. Shale, Hartridge, dark	10	0
2. Coal, soft, columnar	3	0
3. Shale, gray, with plant fossils, pavement		

A sample (No. 724R) was collected from No. 2 of this section, the complete analysis of which is published under **Mine No. 305** in the Table of Coal Analyses at the end of this Chapter. It is now reported that the lease on this mine has been acquired by the Davis Coal Land Company following the death of Nicholas Monsarrat which occurred some months after the writer's last visit to the property.

At the **West Virginia Pulp & Paper Company Exposure (No. 306 on Map II)**, on the eastern slope of Cheat Mountain facing Shavers Fork 1.6 miles southwest of Bemis, the coal is clean and soft, measuring 1′ 8″ at elevation 2974′ B., as recorded in the Cheat Junction Section, pages 162-3.

West Virginia Pulp & Paper Company Prospect—No. 307 on Map II.

On the west side of Shavers Fork just north of Red Roaring Run; **Sewell Coal**; elevation, 2980′ B.; section and elevation reported by W. S. Brydon.

	Ft.	In.
1. Slate, black, laminated		
2. Coal	2	0
3. Fire clay shale, pavement		

At the following locality the coal was mined commercially for a brief period by the West Virginia Pulp & Paper Company but operation has now been suspended for several years:

West Virginia Pulp & Paper Company, Big John Mine—No. 308 on Map II.

On east side of Shavers Fork, 0.6 mile south of Stalnaker Run and 5 miles south of Cheat Junction; **Sewell Coal**; elevation, 3210′ B.

			Ft.	In.
1. Sandstone, massive				
2. Coal, soft	2′	6″		
3. Coal, bony	1	0	3	6
4. Shale, gray, pavement, visible			2	0
5. Concealed			28	0
6. Sandstone, Upper Raleigh (Sharon), pebbly, cliff rock, with many fossil plant stems, to railroad grade			50	0

A sample (No. 746R) was collected from No. 2 of section, about 500 feet from the entrance, the composition of which is published under **Mine No. 308** in the Table of Coal Analyses at the end of this Chapter. At this locality the coal dips westward at an angle of about 2°, the mine being east of the North Potomac (Georges Creek) Syncline.

Sewell (Sharon) Coal, Huttonsville District.

In the portion of Huttonsville District west of Tygart Valley the Sewell Coal appears to be generally good in most of the territory where it should occur. It has been mined for local fuel at a few points and many years ago was opened and mined at lumber operations along Mill Creek. Quite recently commercial mining has been started along this creek. At the **Ward & Hutton No. 2 (66) Coal Test Boring** it is recorded as 1′ 7″ thick. According to Teets the coal was once opened at the **Jacob and Mike Bosworth Farm Mine (No. 309 on Map II)**, on Rich Mountain facing Right Fork of Mill Creek 2.2 miles northwest of Mill Creek town at elevation 2910′ B., but the place had fallen shut and could not be measured.

In the summer of 1926 Mr. John F. Nydegger, of Elkins, made three prospects in the Sewell on a large tract owned by himself along Mill Creek, as follows:

John F. Nydegger Prospect—No. 310 on Map II.

On west side of Mill Creek 4.8 miles southwest of Mill Creek town; Sewell Coal; elevation, 2700′ B.

	Ft.	In.
1. Shale, Hartridge, dark, visible	1	0
2. Coal, clean, reported	1	10
3. Concealed	10	0
4. Sandstone, Upper Raleigh (Sharon), cliff rock, visible	25	0

The above opening had fallen shut at the time of the writer's visit.

John F. Nydegger Prospect—No. 311 on Map II.

On west side of Mill Creek 4.9 miles southwest of Mill Creek town; Sewell Coal; elevation, 2690′ B.

Fallen shut; reported 1′ 8″ thick by Mr. Nydegger; prospect is 15 feet above top of Upper Raleigh (Sharon) Sandstone.

John F. Nydegger Prospect—No. 312 on Map II.

On west side of Mill Creek 5.0 miles southwest of Mill Creek town; Sewell Coal; elevation, 2690′ B.

				Ft.	In.
1.	Slate, black				
2.	Coal, good, hard, columnar	1′	8″		
3.	Slate, black, bony	0	6		
4.	Coal, soft, columnar	2	1		
5.	Coal, very bony	0	10	5	1
6.	Shale, gray, pavement			4	0
7.	Sandstone, Upper Raleigh (Sharon), massive				

A sample (No. 661R) was collected from Nos. 2 and 4 of section, about 10 feet from the surface, the composition of which is published under Mine No. 312 in the Table of Coal Analyses at the end of this Chapter. At this locality the coal dips northwestward at an angle of 13°, the prospect being partly filled with water and there being considerable doubt as to whether the opening had been driven far enough underground to get beyond the zone of weathering.

After making these prospects Mr. Nydegger built a narrow-gauge railroad from Mill Creek town to the property to haul coal, limestone, and timber. According to newspapers and trade journals, a commercial mine has been opened at or near this point by the **Elkins Sewell Coal Company,** managed by Mr. R. F. Starford, the first shipment having been made about the middle of January, 1930. The coal is carried to Mill Creek town over the Nydegger railroad and then transferred to standard-gauge cars for shipment over the Western Maryland Railway.

At the Nydegger openings the coal is 200 feet or more above drainage but the northwestern dip carries it rapidly downward so that the Upper Raleigh (Sharon) Sandstone goes under the creek at the falls slightly more than one mile farther up and the coal is at tipple height. In this locality it was once mined for a brief period many years ago on a semicommercial basis on the 8800-acre tract of the H. G. Davis Heirs, part of which has now become the property of the West Virginia Coal & Coke Company, and part the property of Moore-Keppel & Company. These mines were abandoned when lumber operations ceased in the valley but the following section was measured by the writer in 1916 at the most northeastern opening:

H. G. Davis Heirs (Now Moore-Keppel & Company), Tolbard & Spiker Mine (Abandoned)—No. 313 on Map II.

On Mill Creek, 2.7 miles west of Lee Bell, and 6 miles southwest of Mill Creek town; **Sewell Coal**; elevation, 2730′ B.

				Ft.	In.
1.	Sandstone, massive				
2.	Concealed, sandy shale, and dark slate			15	0
3.	**Coal**, soft	1′	5″		
4.	Slate, bony	0	6		
5.	**Coal**, soft	2	0	3	11
6.	Concealed to massive sandstone, (**Upper Raleigh**)			30	0

While this mine was still in operation a sample was once collected by Dr. I. C. White, the composition of which is published under **Mine No. 313** in the Table of Coal Analyses at the end of this Chapter. The following section was measured by the writer in 1916 at the central opening directly north of the old tipple:

H. G. Davis Heirs (Now Moore-Keppel & Company), Tolbard & Spiker Mine (Abandoned)—No. 314 on Map II.

On Mill Creek, 2.7 miles west of Lee Bell, and 6.1 miles southwest of Mill Creek town; **Sewell Coal**; elevation, 2710′ B.

				Ft.	In.
1.	Slate, black				
2.	**Coal**, soft	1′	0″		
3.	Slate, black	0	6		
4.	**Coal**, soft	2	0		
5.	**Coal**, bony	0	5	3	11
6.	Shale, gray, with plant fossils				

The following very interesting section was measured by the writer in 1916 at the mouth of the west opening which has been shut for many years:

H. G. Davis Heirs (Now Moore-Keppel & Company), Tolbard & Spiker Mine (Abandoned)—No. 315 on Map II.

On Mill Creek, 2.7 miles west of Lee Bell and 6.2 miles southwest of Mill Creek town; **Sewell Coal**; elevation, 2705′ B.

		Ft.	In.
1.	Sandstone, massive	10	0
2.	Shale, dark, sandy	6	0
3.	**Coal**, slaty	0	9
4.	Slate, black, with plant fossils and hard lentils containing **Naiadites, Hartridge Shale**	5	0
5.	**Coal**, thickness concealed, main bed		

The fossils found in the roof shales of the coal at this point are the same as those which occur in such profusion at the Hartridge mine on Buckhannon River, and rather definitely link the coal on Mill Creek with that at Hartridge. It is of interest to note that the Sewell in the Hartridge territory contains no central parting, indicating that this parting should disappear as mining is extended westward in the Mill Creek operations.

In the discussion of this region on pages 238-240 of Volume II(A) of the Survey Dr. I. C. White mentions an opening on Stonecoal Run about two miles above the Davis mine and about one-fourth mile above the mouth of the run, measuring 5′ 3″ of coal and slate. This opening was never found by Teets and the writer when doing field work in that region in 1916; and a search by John F. Nydegger and the writer in 1926 also failed to find it, apparently because of failure to locate "Stonecoal Run" which does not appear on the original topographic map. The first eastern tributary above the Davis mine, emptying into Mill Creek at elevation 2777′ on the map, is known as "Glade Run", and through correspondence with Mr. George Ward, of Mill Creek, it appears that "Stonecoal Run", or "Coal Run", as it is now known, is a small branch emptying from the south, its mouth being almost coincident with that of Glade Run itself. Since field work was completed in the territory Mr. Ward, Mr. Claude W. Maxwell, and Mr. John F. Nydegger have made an opening on Coal Run which may now be described as follows from Mr. Ward's correspondence:

West Virginia Coal & Coke Company Prospect, Coal Run Opening—No. 316 on Map II.

On north side of Coal Run of Mill Creek 0.3 mile from mouth of Coal Run, 0.8 mile west of Cherry Knob, and 6.5 miles southwest of Mill Creek town; **Sewell Coal**; elevation, unknown.

			Ft.	In.
1. Coal	1′	6″		
2. Binder	0	6		
3. Coal	2	2	4	2

Mr. Ward and his associates also reopened the old **Tolbard & Spiker Mine (No. 313 on Map II)** and secured several samples which may be described as follows:

Sample 1-W.—Tolbard & Spiker Mine on Moore-Keppel & Company property (**Mine No. 313 on Map II**); from entire section of 55 inches, including middle binder of 6½ inches; sampled under direction of Claude W. Maxwell.

Sample 2-W.—Tolbard & Spiker Mine as above; top bench of 21 inches.

Sample 3-W.—Tolbard & Spiker Mine as above; bottom bench of 27½ inches.

Sample 4-W. Coal Run Opening of West Virginia Coal & Coke Company (No. 316 on Map II); from entire section of 54 inches; sampled under direction of John F. Nydegger 14 feet from entrance.

Sample 5-W.—Coal Run Opening as above; top bench of 18 inches.

Sample 6-W.—Coal Run Opening as above; bottom bench of 26 inches.

The above samples were mailed to the Survey early in 1928 and were analyzed by Mr. Kaplan under date of March 16, 1929, on an "As Received" basis, as follows:

	1-W. Per cent.	2-W. Per cent.	3-W. Per cent.	4-W. Per cent.	5-W. Per cent.	6-W. Per cent.
Moisture	1.28	1.38	1.94	0.46	0.40	0.54
Volatile Matter	21.01	22.00	26.57	24.56	29.10	24.74
Fixed Carbon	56.23	56.20	67.68	50.67	60.32	56.06
Ash	21.48	20.42	3.81	24.31	10.18	18.66
Totals	100.00	100.00	100.00	100.00	100.00	100.00
Sulphur	0.50	0.49	0.51	0.60	0.87	0.55
B. T. U.	11,143	11,556	13,844	-----	-----	-----

It is very well known in this region that the upper bench of the Sewell is better than the lower and the further correspondence with Mr. Ward indicates a probability that Samples 2-W and 3-W may have been interchanged, as No. 3-W is more probably the upper bench. In this connection Mr. Ward makes the following statement:

"We have further determined that the excess ash to a great extent is carried by a bony ply of coal ten inches thick and immediately underneath the binder. If the ten inches of bony coal is eliminated we get an average ash content of around 6 per cent."

Few of the available samples along Mill Creek have been taken under more than a few feet of cover and they therefore represent outcrop coal which has been much weathered. Clean samples from beneath good cover would presumably show a much more favorable content of ash.

In the portion of Huttonsville District covering part of the valley of Shavers Fork, there is a large body of Sewell Coal. The diamond drill holes published in this Chapter show it as follows:

West Virginia Pulp & Paper Co. No. 1A	(50)--	7′ 6″	(slaty)
West Virginia Pulp & Paper Co. No. 5	(54)--	2′ 7″	
West Virginia Pulp & Paper Co. No. 7	(56)--	1′ 3″	(bony)
West Virginia Pulp & Paper Co. No. 8A	(58)--	4′ 5″	(bony)
West Virginia Pulp & Paper Co. No. 8B	(59)--	4′ 6″	(bony)
West Virginia Pulp & Paper Co. No. 9	(60)--	1′ 8″	(bony)
West Virginia Pulp & Paper Co. No. 11	(62)--	2′ 9″	(bony)
West Virginia Pulp & Paper Co. No. 13	(64)--	10′ 10″	(bony)
West Virginia Pulp & Paper Co. No. 14	(65)--	5′ 11″	(slaty)

The detailed records of these borings should be consulted to note the nature of such bone and slate as occurs. In this territory the usual bottom bony ply is generally found and near the middle of the mining bench there is usually a cannel bone which is a few inches thick at the northern end of the district but which gradually thickens to the southward.

From 1920 until 1925 the coal was mined at the two following openings but more recently they have been temporarily closed down, most of the machinery and equipment being left on the ground:

West Virginia Pulp & Paper Company, Linan No. 1 Mine—No. 317 on Map II.

On east side of Shavers Fork 0.4 mile north of Crouch Run and about 5½ miles north of Cheat Bridge; Sewell Coal; elevation, 3415′ B.

				Ft.	In.
1.	Sandstone, massive				
2.	Coal, soft	1′	4″		
3.	Coal, bony	0	5		
4.	Coal, soft	1	8	3	5
5.	Slate, pavement				

This section was measured at the entrance to the aircourse where the coal was too much weathered for sampling, access into the interior of the workings being impossible.

West Virginia Pulp & Paper Company, Linan No. 2 Mine—No. 318 on Map II.

On west side of Shavers Fork 0.4 mile north of Crouch Run and about 5½ miles north of Cheat Bridge; Sewell Coal: elevation, 3420′ B.

				Ft.	In.
1.	Shale, dark, roof				
2.	Coal, soft	1′	9″		
3.	Coal, hard, bony	0	6		
4.	Coal, soft	1	11		
5.	Coal, bony	0	6	4	8
6.	Shale, gray, pavement				

This measurement was made in Room No. 12 off Second Left. A sample (No. 745R) was collected from Nos. 2 and 4 of section, the composition of which is published under **Mine No. 318** in the Table of Coal Analyses at the end of this Chapter. The entrance to this mine is only 18 feet above the river, and the coal had to be slightly raised to get it on the tipple. From the mine entrance westward it dips slightly for several hundred feet and then rises toward Cheat Mountain. The visible equipment on the ground consists of a tipple, siding, electric plant, electric haulage motors and cutters and mine cars. At the point sampled the coal is slightly squeezed and another measurement was made in First Left, showing the following section:

				Ft.	In.
1.	Sandstone, massive				
2.	**Coal**, soft	1′	4″		
3.	Bone	0	1		
4.	**Coal**	0	5		
5.	Bone	0	1		
6.	**Coal**, soft	3	1	5	0
7.	Slate, pavement				

Nos. 3-5 of the above section constitute the parting which develops in the coal near this locality. This parting does not appear to exist farther north but southward it increases in size, becoming mostly cannel bone.

On the mine dump there are many beautiful specimens of fossil plants, coming from above the coal, partly in sandstone and partly in the draw slate. **Fossil Lot 449** was collected and placed in storage at Morgantown, as will be further noted in Chapter XIV.

According to A. O. Baxter, of Marlinton, W. Va., engineer of the company, reptile tracks have been found in the roof shales in or near Room No. 11, off Second Left, at this mine, there being two sizes of parallel tracks, presumably of the front and rear feet which are always of unequal size. The writer, in company with Reuben and H. F. Cromer, Jr., of Cheat Bridge, made a search for these reported foot-prints, but they were not found, the depth of water and other conditions making it impossible to give a thorough investigation.

West Virginia Pulp & Paper Company Prospect—No. 319 on Map II.

On west side of Shavers Fork just south of Whitmeadow Run 3.6 miles north of Cheat Bridge; **Sewell Coal**; elevation, 3530′ B.

				Ft.	In.
1.	Sandstone, Lower Guyandot, massive			25	0
2.	Coal, soft	1′	4″		
3.	Slate, black, bony	0	8		
4.	Coal, soft	0	10	2	10
5.	Shale, gray, concealed and black slate, with Naiadites			15	0
6.	Coal, Welch (Exposure No. 405), slaty			1	0
7.	Slate, black			1	0
8.	Sandstone, Upper Raleigh (Sharon), massive, pebbly, in river, visible			3	0

A sample (No. 221R) was collected from Nos. 2 and 4 of section, the analysis by company chemists on a moisture-free basis being as follows:

		Per cent.
Volatile Matter		27.21
Fixed Carbon		61.87
Ash		10.92
Sulphur		1.40
B. T. U.	13,426	

West Virginia Pulp & Paper Company, Whitmeadow Mine—No. 320 on Map II.

On west side of Shavers Fork 0.2 mile south of Whitmeadow Run and 3.5 miles north of Cheat Bridge; Sewell Coal; elevation, 3475′ B.

				Ft.	In.
1.	Sandstone, Lower Guyandot, massive			25	0
2.	Coal, soft, columnar	1′	0″		
3.	Cannel bone	0	8		
4.	Coal, soft, columnar	0	9	2	5
5.	Shale, gray, with plant roots			2	0
6.	Concealed to river			25	0
7.	Sandstone, Upper Raleigh (Sharon), in river bed				

A sample (No. 748R) was collected from Nos. 2 and 4 of section and another (No. 749R) from the cannel bone, No. 3 of section, about 300 feet from the entrance, the composition of the former being published under Mine No. 320 in the Table of Coal Analyses at the end of this Chapter. The cannel bone shows the following analysis:

	Per cent.
Moisture	0.20
Volatile Matter	14.65
Fixed Carbon	31.58
Ash	53.57
Total	100.00
Sulphur	0.31
B. T. U.	4,988

A considerable entry was driven at this point and some coal was mined but the project has been abandoned.

West Virginia Pulp & Paper Company Prospect—No. 321 on Map II.

On south side of Stonecoal Run 0.1 mile above the mouth and 1.7 miles northwest of Cheat Bridge; **Sewell Coal**; elevation, 3520′ B.

						Ft.	In.
1.	**Shale, Hartridge,** sandy					20	0
2.	**Coal**			0′	2″		
3.	Slate, dark			0	6		
4.	**Coal,** soft, good			1	5		
5.	Slate, black, bony			1	0		
6.	**Coal,** soft, good			1	8		
7.	Slate, black	0′	4″				
8.	**Coal**	0	3				
9.	Slate, bony	0	8				
10.	**Coal,** bony	0	6	1	9	6	6
11.	Slate, black, pavement, and concealed					2	0
12.	**Sandstone, Upper Raleigh (Sharon),** massive, pebbly, in creek						

At this prospect it is evident that Nos. 7-10 make up the bottom bony ply, while No. 5 is the cannel bone that splits the mining bench.

West Virginia Pulp & Paper Company, Red Run Mine—No. 322 on Map II.

On west side of Shavers Fork just north of Red Run and 1.5 miles north of Cheat Bridge; **Sewell Coal**; 3565′ B.

						Ft.	In.
1.	**Shale, Hartridge,** dark, sandy, roof					10	0
2.	**Coal,** very slaty			1′	2″		
3.	**Coal,** good			0	10		
4.	Slate, bony			1	3		
5.	**Coal,** good			1	5		
6.	Slate, dark, soft	0′	1″				
7.	**Coal,** bony	0	5				
8.	**Coal,** bony or slaty?, covered by water	1	2	1	8	6	4
9.	Pavement and concealed to river					25	0

A sample (No. 750R) was collected from Nos. 3 and 5 of section, the composition of which is published under **Mine No. 322** in the Table of Coal Analyses at the end of this Chapter. This mine, which is now abandoned, had been driven several hundred feet under cover but owing to the westward dip it was impossible to get more than 10 feet beyond the entrance, and at this point the bottom was covered by water.

At the West Virginia Pulp & Paper Company Exposure (No. 323 on Map II), on the Staunton and Parkersburg Pike 0.3 mile northwest of Cheat Bridge, the blossom of the coal is exposed at elevation 3779′ B., as recorded in the Cheat Bridge Section, page 167.

West Virginia Pulp & Paper Company Farm Mine, Club House Opening—No. 324 on Map II.

On west side of Shavers Fork 0.9 mile southwest of Cheat Bridge; Sewell Coal; elevation, 3780′ B.

				Ft.	In.
1.	Sandstone, Lower Guyandot, massive, visible			5	0
2.	Coal, soft	0′	7″		
3.	Coal, hard, bony	0	2		
4.	Coal, soft	1	0		
5.	Cannel bone	1	6		
6.	Coal, medium-soft	1	5	4	8
7.	Slate, pavement				

A sample (No. 751R) was collected from Nos. 2, 3, and 4 of section, the composition of which is published under Mine No. 324 in the Table of Coal Analyses at the end of this Chapter. When the writer visited this opening for sampling in the autumn of 1927, No. 6 was covered by water, but the thickness was known from a former visit in 1917.

The West Virginia Pulp & Paper Company Prospect (No. 325 on Map II), at the head of a ravine of Shavers Fork one mile northeast of the mouth of First Fork and 2.8 miles south of Cheat Bridge, was not visited by the writer and its elevation is unknown. It is reported on the authority of Pearl Cromer, of Cheat Bridge, who describes the coal as 3′ 4″ thick.

Sewell (Sharon) Coal, Mingo District.

In Mingo District there is a large acreage of Sewell (Sharon) Coal in the Point Mountain, Back Fork of Elk, and Gauley Mountain country, there being generally a clean, pure mining bench three or four feet in thickness. At the following opening considerable coal was mined when lumber operations were in progress in the valley of Back Fork of Elk in 1916 or 1917 but mining of the coal ceased when the railroad was removed:

Croft Lumber Company Mine—No. 326 on Map II.

On Back Fork of Elk River, 1.8 miles south of the Parting Springs; Sewell Coal; elevation, 3000′ B.

				Ft.	In.
1.	Slate, dark				
2.	Coal, slaty	1′	8″		
3.	Shale, gray, 3′ 0″ to	1	0		
4.	Coal, soft, columnar	3	8	6	4
5.	Slate, pavement				

"Principal office, Alexander; coal owned by Holly Lumber Company; coal used for locomotives on Alexander and Eastern Railroad; sample collected from No. 4 of section in Main Heading; R. M. Chandler, Superintendent, authority for mine data."

The composition of this sample is published under **Mine No. 326** in the Table of Coal Analyses at the end of this Chapter.

The **Hale & Kinney Prospect (No. 327 on Map II),** on Vandevender (Coalbank) Fork of Back Fork of Elk 3.8 miles northwest of Monterville, measured 3′ 7″ of clean coal at elevation 3260′ B. The **Strader Heirs Prospect (No. 328 on Map II),** on Vandevender Fork 3.3 miles northwest of Monterville at elevation 3460′ B. (?), had fallen shut, its thickness being reported as three feet by Lee A. Hamrick. The recorded elevation at this prospect is evidently an error, since the coal is only 3260′ B. at **Mine No. 327** and only 3310′ B. at **Mine No. 329.** It would appear that the writer's aneroid had been misread in the bitterly cold weather of early December, 1915, when his visit to this prospect was made.

At the following opening, which was visited in the autumn of 1927, considerable coal had once been mined, but was abandoned when the lumber railroad was removed:

Croft Lumber Company Mine (Abandoned)—No. 329 on Map II.

On south side of Vandevender (Coalbank) Fork of Back Fork of Elk, 1.8 miles southeast of junction of this fork with Back Fork and 3.4 miles northwest of Monterville; **Sewell Coal**; elevation, 3310′ B.

				Ft.	In.
1.	Sandstone, Lower Guyandot, massive			15	0
2.	Coal, medium-hard	3′	10″		
3.	Coal, bony	0	10	4	8
4.	Shale, hard, pavement, and concealed			3	0
5.	Sandstone, massive, with casts of Lepidodendron, in creek				

A sample (No. 743R) was collected from No. 2 of section, in a pillar not far from the entrance, the composition of which is published under **Mine No. 329** in the Table of Coal Analyses at the end of this Chapter.

William Vandevender Heirs Farm Mine—No. 330 on Map II.

On Vandevender (Coalbank) Fork of Back Fork of Elk, 2.5 miles northwest of Monterville; **Sewell Coal**; elevation, 3530′ B.

			Ft.	In.
1. Sandstone, shaly				
2. Coal, soft, columnar	3′	8″		
3. Slate, bony	0	10	4	6
4. Slate, pavement				

A sample (No. 161R) was collected from No. 2 of section, the composition of which is published under **Mine No. 330** in the Table of Coal Analyses at the end of this Chapter.

The following opening is reported by Teets on the east side of Rich Mountain on the Tygart River drainage:

Lee Swecker Farm Mine—No. 331 on Map II.

On Stony Run of Elkwater Fork of Tygart River, 2.3 miles northwest of Monterville; **Sewell Coal**; elevation, 3535′ B.

			Ft.	In.
1. Sandstone, shaly				
2. Coal, soft	3′	0″		
3. Coal, bony	0	8	3	8
4. Slate, pavement				

In 1928 Mr. Claude W. Maxwell, of Elkins, secured a sample (7-W) from this opening, the same being shipped to the Survey by Mr. George Ward, of Mill Creek, and described as taken from 45 inches of clean coal. As analyzed by Mr. Kaplan in March, 1929, on an "As Received" basis, the composition is as follows:

	Per cent.
Moisture	0.89
Volatile Matter	27.41
Fixed Carbon	66.17
Ash	5.53
Total	100.00
Sulphur	1.39

The **Davis and Elkins Prospect (No. 332 on Map II)**, on Point Mountain at the head of Hewett Fork of Back Fork of Elk at an elevation of 3695′ B., had been opened by stripping, the hole being partly full of water. Above the water 3′ 0″ of clean coal was visible in the winter of 1915, the total depth from the top of the coal to the bottom of the pit being 4′ 2″, the lower portion of which probably includes the usual streak of bony coal.

PLATE LV.—View along Seneca Trail 1.7 miles south of Valley Head looking northwest. Hendricks Sandstone of Chemung, visible in cut, forms low ridge between Tygart River and Logan Run. (Photo. by E. E. Harris.)

PLATE LVI.—View from Staunton and Parkersburg Pike on western slope of Cheat Mountain, looking northwest down Riffle Creek. Immediate foreground is Catskill but middle ridges at right and left are Chemung and probably Weverton Peneplain. At extreme rear is Rich Mountain, west of Tygart Valley, and capped by Pottsville. (Photo. by E. E. Harris.)

PLATE LVII.—View from Staunton and Parkersburg Pike near top of Back Allegheny Mountain, Pocahontas County, looking northeast toward Pendleton County. Immediate foreground is Mauch Chunk with grassy fields of Greenbrier Series lower down, followed by Pocono, Catskill, and Chemung ridges. High point in extreme left background is Pharis Knob, capped by Mauch Chunk. Spruce Knob, Pendleton County, is too dim to be seen.
(Photo. by E. E. Harris.)

PLATE LVIII. General view of Elkins Sandstone of Chemung Series at type locality in cut of State road north of Tygart River 2.6 miles northwest of Elkins, showing fossil tree trunks at Fossil Lot 396. (Photo. by E. E. Harris.)

Davis and Elkins Farm Mine, Geo. B. Swecker Opening—No. 333 on Map II.

Along the State road at the eastern end of Point Mountain 2.1 miles west of Monterville; **Sewell Coal**; elevation, 3600′ B.

				Ft.	In
1.	Shale, Hartridge, sandy, partly concealed, with plant fossils at base			20	0
2.	Coal, soft, good	3′	6″		
3.	Coal and slate, bony	1	5	4	11
4.	Shale, pavement				

A sample (No. 691R) was collected from No. 2 of section, the composition of which is published under **Mine No. 333** in the Table of Coal Analyses at the end of this Chapter.

The **Hale & Kinney Prospect (No. 334 on Map II)**, on Point Mountain facing Redlick Run of Valley Fork of Elk, at an elevation of 3600′ B., had fallen shut, the coal being reported 3′ 10″ thick by Lee A. Hamrick.

S. C. Riggleman Farm Mine—No. 335 on Map II.

On Redlick Run of Valley Fork of Elk, on south side of Point Mountain; **Sewell Coal**; elevation, 3530′ B.

				Ft.	In
1.	Sandstone, shaly				
2.	Slate, dark				
3.	Coal, medium-hard	3′	6″		
4.	Coal, bony	0	2	3	8
5.	Sandstone, massive			12	0
6.	Coal, reported			1	6

Hale and Kinney Farm Mine—No. 336 on Map II.

On south side of Point Mountain at the head of Hickorylick Run of Valley Fork of Elk, 2.4 miles northwest of Blue Spring; **Sewell Coal**; elevation, 3425′ B.

		Ft.	In.
1.	Slate, dark		
2.	Coal, hard, splinty	5	2
3.	Slate, pavement		

A sample was collected from this opening, the composition of which is published under **Mine No. 336** in the Table of Coal Analyses at the end of this Chapter.

The **Hale and Kinney Farm Mine (No. 337 on Map II)**, on the south side of Point Mountain at the head of Hickorylick Run of Valley Fork of Elk River 2.7 miles northwest of Blue Spring at elevation 3400′ B., measured 3′ 6″ of clean, medium-hard coal.

In the sharp triangle of the county which extends south from Elk River into the Gauley Mountain and Gauley River country, there have been only a few openings but there are several closely adjacent in Webster County and a few in Pocahontas, as follows:

Pardee & Curtin Lumber Company Prospect, Paris Green Opening—No. 338 on Map II.

Fork Lick District, Webster County; on a branch of Bergoo Creek 5.2 miles eastward from Bergoo town; **Sewell Coal**; elevation, 3175' B.

				Ft.	In.
1.	Slate, dark				
2.	**Coal**, soft	2'	0½"		
3.	Slate, dark	0	6½		
4.	**Coal**, soft	3	0	5	7
5.	Slate, pavement				

A sample (No. 231R) was collected from Nos. 2 and 4 of section, the composition of which, as analyzed on a moisture-free basis in the private laboratory of the West Virginia Pulp & Paper Company, at Luke, Md., is as follows:

		Per cent.
Volatile Combustible Matter		29.19
Fixed Carbon		62.64
Ash		8.17
Total		100.00
Sulphur		1.16
B. T. U.	13,967	

The following opening, where the coal has been mined by stripping, is reported by D. D. Teets, Jr., and seems to represent the Sewell Coal although the level appears slightly too low for this coal in the particular locality where it was noted:

W. H. Green Farm Mine—No. 338A on Map II.

Fork Lick District, Webster County; on a southern branch of Bergoo Creek, 5.1 miles eastward from Bergoo town; **Sewell Coal**; elevation, 3140' B.

		Ft.	In.
1.	Slate		
2.	**Coal**, soft	3	0
3.	Concealed		

A sample (No. 13) was collected from this opening by Mr. Teets, the composition of which, as analyzed by Mr. M. N. Newman in the laboratory of the Bethlehem Steel Corporation at Sparrows Point, Md., apparently on a moisture-free basis, is as follows:

Proximate Analysis:	Per cent.
Volatile Matter	31.50
Fixed Carbon	66.02
Ash	2.48
Total	100.00
Ultimate Analysis:	
Carbon	84.20
Hydrogen	5.29
Oxygen	6.74
Ash	2.48
Sulphur	0.54
Phosphorus	0.005
B. T. U. 15,255	

Pardee & Curtin Lumber Company Farm Mine, Robert Rose Opening—No. 338B on Map II.

Fork Lick District, Webster County; on a southern branch of Bergoo Creek, 4 miles southeast of Bergoo town; **Sewell Coal**; elevation, 3150' B.

				Ft.	In.
1.	Shale, Hartridge, dark, sandy			10	0
2.	Coal, soft	0'	5"		
3.	Slate, dark	0	5		
4.	Coal, soft	2	7	3	5
5.	Slate, pavement				

A sample (No. 199R) was collected from Nos. 2 and 4 of section, the composition of which is published under **Mine No. 338B** in the Table of Coal Analyses at the end of this Chapter.

Pardee & Curtin Lumber Company Prospect—No. 338C on Map II.

Fork Lick District, Webster County; between the forks of Leatherwood Creek 3.2 miles southeast of Bergoo town; **Sewell Coal**; elevation, 2980' B.

		Ft.	In.
1.	Slate, black		
2.	Coal, medium-soft	4	3
3.	Slate, pavement		

A sample (No. 197R) was collected from this opening, the composition of which is published under **Mine No. 338C** in the Table of Coal Analyses at the end of this Chapter.

At the **Pardee & Curtin Lumber Company Prospect** (No.

339 on Map II), on the north side of Gauley River 0.4 mile northward from Three Forks of Gauley, there was one foot of coal visible at elevation 3150′ B., as indicated in the Three Forks of Gauley Section, page 186, but there is doubt whether this prospect, which was hastily made by the writer, represents the full thickness of the coal.

West Virginia Pulp & Paper Company Prospect—No. 340 on Map II.

Mingo District, Randolph County; on Gauley Mountain facing Elk River one mile southeast of Whitaker Falls; Sewell Coal; elevation, 3485′ B.

	Ft.	In.
1. Sandstone, Lower Guyandot, massive, with small quartz pebbles	67	0
2. Shale, Hartridge, sandy, with iron nodules	3	0
3. Coal, medium-soft	4	8
4. Shale		

A sample (No. 230R) was collected from this opening and analyzed in the private laboratory of the West Virginia Pulp & Paper Company at Luke, Md., on a moisture-free basis, as follows:

		Per cent.
Volatile Combustible Matter		31.73
Fixed Carbon		65.10
Ash		3.17
Total		100.00
Sulphur		0.60
B. T. U.	14,713	

It is reported by coal scouts that a mine is now being operated at or near this locality to supply present lumber operations and other needs of the company.

West Virginia Pulp & Paper Company, Isom Folks Opening —No. 341 on Map II.

Mingo District, Randolph County; on Elk Mountain between Valley Fork and main Elk River 1.5 miles southwest of Blue Spring; Sewell Coal; elevation, 4010′ B.

	Ft.	In.
1. Sandstone, shaly		
2. Shale, Hartridge, dark	2	0
3. Coal, soft	2	0
4. Slate, pavement		

At this point the prospect had fallen shut, the measurement being made at the outcrop. A sample (No. 203R) was collected from the coal, the composition of which is published under Mine No. 341 in the Table of Coal Analyses at the end of this Chapter.

Cherry River Boom & Lumber Company Prospect—No. 342 on Map II.

Edray District, Pocahontas County; on Gauley Mountain at the head of Laurel Run of Elk River 2.3 miles southwest of Slaty Fork town; Sewell Coal; elevation, 4225′ B.

				Ft.	In.
1.	Slate, dark				
2.	Coal, medium-soft	5′	1″		
3.	Concealed, with streaks of coal, reported	7	0		
4.	Coal	1	0	13	1

The prospects and analyses of the Sewell Coal in or adjacent to this long southern hook of Randolph County indicate that the seam is of great excellence and purity.

Sewell (Sharon) Coal, Dry Fork District.

In the North Potomac (Georges Creek) Basin, embracing the valley of Otter Creek, partly in Tucker County and partly in Randolph, and the eastern side of the valley of Shavers Fork of Cheat from Bowden to Bemis, slight attempt was made to prospect or mine the Sewell (Sharon) Coal until 1925 or 1926. A few prospects had been made in Tucker County near the mouth of Otter Creek and a small mine was operated for a time on the head of Condon Run of Otter Creek in Randolph County while lumber operations were in progress. In 1925 or 1926, however, the Thompson Coal Company began prospecting its large tract northeast of Bemis, finding a considerable acreage of good coal; and in the summer of 1926 the writer began field studies in this region. It soon became apparent that a large amount of good coal should exist in Shavers and McGowan Mountains and a plan of prospecting was therefore undertaken to get the desired information to publish in this Report. In cooperation with landowners and with the engineering department of the Western Maryland Railway numerous key prospects were made at critical points on most of the properties involved, these being followed up by many additional openings made by the owners. This work was mostly done in the field seasons of 1926 and 1927, the results being now available for publication. Such openings as have been made since 1927 have not been visited but some of them have been reported by engineers or other parties. In the prosecution of this work, the character of which was decidedly different from the usual functions of a State Survey, a very fine spirit of cordiality and cooperation developed among the different interests involved, affording a result that should be of great economic benefit to the region.

In the description of these openings such work as has now been done in the lower valley of Otter Creek in Tucker County, in so far as it is known to the writer, is included in the present Report because of its close connection with the portion of the basin lying southward in Randolph County.

Arnold Estate Prospect—No. 343 on Map II.

Black Fork District, Tucker County; on McGowan Mountain facing Dry Fork one mile south of Hendricks; Sewell Coal; elevation, 2890' B.; reported and sampled by C. P. McCausland, Engineer, Western Maryland Railway.

				Ft.	In.
1.	Coal	1'	11"		
2.	Bone coal	0	2		
3.	Coal	1	2½		
4.	Bone coal	0	5	3	8½
5.	Slate, black, pavement				

At this prospect Mr. McCausland took a sample (W. Md.-1) from Nos. 1 and 3 of section and another (W. Md.-2) from the bone coal, No. 2 of section, 50 feet from the entrance and under 25 feet of cover. The analyses of these samples by Mr. Kaplan are as follows:

	W. Md.-1. Per cent.	W. Md.-2. Per cent.
Moisture	0.17	0.17
Volatile Matter	23.33	19.23
Fixed Carbon	60.35	46.75
Ash	16.15	33.85
Totals	100.00	100.00
Sulphur	0.53	0.40
B. T. U.	12,894	10,000

These samples were taken in May, 1928, but were not analyzed until March, 1929, and hence were practically air-dried.

Adam Phillips Prospect—No. 344 on Map II.

Black Fork District, Tucker County; on McGowan Mountain facing Dry Fork one mile northwest of Otter Station; Sewell Coal; elevation, 2790' B.; visited by David B. Reger in 1919; prospect fallen shut; thickness reported by Adam Phillips.

				Ft.	In.
1.	Shale, Hartridge, dark			10	0
2.	Coal, good, reported	3′	6″		
3.	Coal, slaty, reported	0	6	4	0

A sample (No. 427R) was collected from a clean stock pile that had lain on the dump four years, the composition of which is published under Mine No. 344 in the Table of Coal Analyses at the end of this Chapter.

Another opening slightly northward was visited by Mr. McCausland in 1928, being described as follows:

William Phillips Prospect—No. 344A on Map II.

Black Fork District, Tucker County; facing Dry Fork opposite Laurel Run; Sewell Coal; elevation, 2920′ B.; reported and sampled by C. P. McCausland.

				Ft.	In.
1.	Clay, blue, soft			0	1½
2.	Coal	2′	7½″		
3.	Bone	0	4	2	11½

A sample (W. Md.-4) was taken by Mr. McCausland from No. 2 of section 50 feet from the entrance and under 45 feet of cover, the composition of which is reported by Mr. Kaplan in March, 1929, practically on an air-dried basis, as follows:

		Per cent.
Moisture		0.10
Volatile Matter		22.65
Fixed Carbon		68.55
Ash		8.70
Total		100.00
Sulphur		0.43
B. T. U.	14,100	

J. J. Teter Prospect—No. 345 on Map II.

Black Fork District, Tucker County; on McGowan Mountain facing Otter Creek 1.9 miles northwest of Otter Station; Sewell Coal; elevation, 2900′ B.; reported and sampled by C. P. McCausland in May, 1928.

				Ft.	In.
1.	Clay, soft, soapy			0	1½
2.	Draw slate			0	4
3.	Coal	1′	10″		
4.	Bone	0	4	2	2
5.	Slate, black				

A sample (W. Md.-3) was taken by Mr. McCausland from No. 3 of section, the composition of which on a practically air-dried basis is reported by Mr. Kaplan in March, 1929, as follows:

	Per cent.
Moisture	0.85
Volatile Matter	24.41
Fixed Carbon	66.74
Ash	8.00
Total	100.00
Sulphur	0.40
B. T. U.	13,500

Otter Creek Boom & Lumber Company Prospect—No. 346 on Map II.

Dry Fork District, Tucker County; on Coal Run of Otter Creek 1.1 miles southwest of Otter Station; Sewell Coal; elevation, 2720′ B.

	Ft.	In.
1. Shale, Hartridge, dark	9	6
2. Coal	0	6
3. Sandstone, Upper Raleigh (Sharon), massive	30	0
4. Concealed, with sandstone and shale, to red beds	90	0

Otter Creek Boom & Lumber Company Prospect—No. 347 on Map II.

Dry Fork District, Tucker County; on Green Mountain facing Dry Fork 1.2 miles south of Otter Station; Sewell Coal; elevation, 2940′ B.

			Ft.	In.
1. Sandstone, Guyandot, massive cliff			30	0
2. Concealed			15	0
3. Sandstone, Lower Guyandot, massive			10	0
4. Concealed			15	0
5. Coal, soft, reported	1′	6″		
6. Slate, reported	0	1		
7. Coal, soft, reported	1	6	3	1

The above prospect had fallen shut, the section of the coal being reported by Adam Phillips, guide.

Otter Creek Boom & Lumber Company Prospect—No. 348 on Map II.

Dry Fork District, Tucker County; on north side of Green Mountain facing Otter Creek 1.6 miles southwest of Otter Station; Sewell Coal; elevation, unknown.

				Ft.	In.
1.	Coal, reported	2′	4″		
2.	Slate, reported	2	0		
3.	Coal, reported	1	8	6	0

The above section of this opening is inscribed on the field sheet of the writer but the authority for the report has been forgotten.

Otter Creek Boom & Lumber Company Prospect—No. 349 on Map II.

Dry Fork District, Tucker County; on west side of Green Mountain opposite Turkey Run 2.8 miles southwest of Otter Station; Sewell Coal; elevation, unknown.

Reported 3′ 6″ thick.

The above notation likewise appears on the field sheet of the writer, without reference to authority.

J. J. Teter Prospect—No. 350 on Map II.

Black Fork District, Tucker County; on McGowan Mountain facing Otter Creek 0.7 mile south of Turkey Run, 3.1 miles southwest of Otter Station; Sewell Coal; elevation, 2760′ B.; reported and sampled by C. P. McCausland.

				Ft.	In.
1.	Slate				
2.	Coal	0′	8½″		
3.	Binder	0	3		
4	Coal	1	0½		
5.	Binder	0	1½		
6.	Coal	1	2	3	3½
7.	Slate, black, pavement				

A sample (W. Md.-5) was collected by Mr. McCausland from Nos. 2, 4, and 6 of section in the face of the coal as exposed in Teter Run in May, 1928, the composition of which, on a practically air-dried basis, was reported by Kaplan in March, 1929, as follows:

		Per cent.
Moisture		0.10
Volatile Matter		24.40
Fixed Carbon		66.56
Ash		8.94
Total		100.00
Sulphur		0.68
B. T. U.	13,800	

It is understood that other prospects have now been made in the Tucker County part of the Otter Creek Valley, but, if so, they have not been reported and the writer has had no late opportunity to visit the territory. The others which now follow are all in Dry Fork District, Randolph County:

Otter Creek Boom & Lumber Company, Reger Opening—No. 351 on Map II.

On west side of Otter Creek opposite Camp 16 and just south of Condon Run 3 miles northeast of Bowden; **Sewell Coal**; elevation, 3095′ B.

Found 1′ 0″ of coal without reaching roof; prospect incomplete.

At the above locality the writer, in company with B. J. Coberly, dug into the coal but found too much debris to reach the full section of the coal.

At the **Otter Creek Boom & Lumber Company Mine (No. 352 on Map II)**, on the north side of Condon Run of Otter Creek one mile from the mouth of the run and 2.5 miles northeast of Bowden a coal was once opened and mined by the company for a time for its lumber operations but the place has long been abandoned. The elevation is 3330′ B., which at this locality would appear to make it the Sewell Coal. No report as to its thickness was obtained.

At the **Otter Creek Boom & Lumber Company Prospect (No. 353 on Map II)**, on the east side of Taylor Run along the forestry trail just south of the Otter Creek summit and 2.8 miles northeast of Bowden, the coal was once mined for a short while at elevation 3100′ B., but the place had fallen shut and its thickness was not learned.

Arnold Cunningham Prospect—No. 354 on Map II.

On Shavers Mountain facing Taylor Run 2.7 miles northeast of Bowden; **Sewell Coal**; elevation, 3125′ B.

			Ft.	In.
1. Shale, dark				
2. Coal, soft	3′	2″		
3. Bone	0	4	3	6
4. Shale, gray, pavement				

The above opening was not driven beneath cover and was too much weathered for sampling. According to Mr. Cunningham he has now made other prospects on his land.

Ward & Triplett Prospect—No. 355 on Map II.

On Middle Point facing Taylor Run 2.5 miles northeast of Bowden; **Sewell Coal**; elevation, 3115′ B.

	Ft.	In.
1. Shale, Hartridge, dark	5	0
2. Coal, soft, good, columnar	3	4
3. Fire clay shale, gray, pavement		

A sample (No. 752R) was collected from No. 2 of this prospect, 15 feet from the entrance, the composition of which is published under Mine No. 355 in the Table of Coal Analyses at the end of this Chapter.

J. B. Ward, Jr., Prospect, Reger Opening—No. 356 on Map II.

On Middle Point facing Taylor Run 2.1 miles northeast of Bowden; Sewell Coal; elevation, 3140′ B.

				Ft.	In.
1.	Shale, Hartridge, dark				
2.	Coal, soft, good, 3′ 0″ to	2′	7″		
3.	Coal, bony	0	5	3	0
4.	Shale, gray, pavement, and concealed			15	0
5.	Sandstone, Welch				

A sample (No. 725R) was collected from No. 2 of section, 20 feet from the entrance, the composition of which is published under Mine No. 356 in the Table of Coal Analyses at the end of this Chapter. The face of this point is covered with a great amount of debris and the coal was found only after a very painstaking search.

J. B. Ward, Jr., Prospect—No. 357 on Map II.

On Middle Point facing Stalnaker Run of Taylor Run 1.7 miles northeast of Bowden; Sewell Coal; elevation, 3210′ B.

		Ft.	In.
1.	Shale, Hartridge?, dark-gray, with plant fossils	3	0
2.	Coal, soft	1	0
3.	Fire clay shale, pavement		

There is some slight doubt as to the correlation of the coal at this point but it appears to be at or near the Sewell horizon. Mr. Ward now advises that he has made other prospects on this property but the details are not available. In searching for the coal he found it necessary to plant heavy charges of dynamite in holes which were drilled deeply into the debris and his method has proved to be quite satisfactory for the conditions encountered.

Emil Knutti Prospect, Reger Opening—No. 358 on Map II.

On mountain spur west of Stalnaker Run of Taylor Run one mile northeast of Bowden; Sewell Coal; elevation, 3415′ B.

				Ft.	In.
1.	Soil and shale, not in place				
2.	Coal, soft	3′	0″		
3.	Coal, bony	0	2	3	2
4.	Shale, gray, with plant roots			6	0

A sample (No. 709R) was collected from No. 2 of section the composition of which is published under **Mine No. 358** in the Table of Coal Analyses at the end of Chapter. This sample was still in the weathered zone and the condition is reflected to some extent in the analysis.

M. J. Coberly Prospect, Reger Opening—No. 359 on Map II.

On Bickle Knob 0.4 mile east of summit of knob and 2 miles northwest of Bowden; **Sewell Coal**; elevation, 3750′ B.

Found 2′ 0″ of coal without reaching roof; full thickness unknown.

In this search for coal the writer had the assistance of J. B. Ward, Jr., and J. W. Calain.

Forest Glen Land Company Prospect—No. 360 on Map II.

On Bickle Knob 0.4 mile northeast of summit of knob and 2.2 miles northwest of Bowden; **Sewell Coal**; elevation, 3750′ B.

Fallen shut, reported 3′ 0″ to 4′ 0″ thick by J. W. Calain.

A sample (No. 667R) was collected from a stock pile on the dump, the composition of which is published under **Mine No. 360** in the Table of Coal Analyses at the end of this Chapter. The analysis shows very good coal.

At the **Charles Baker Exposure (No. 361 on Map II)**, on the south side of Bickle Knob 0.2 mile from the top of the knob and 2 miles northwest of Bowden, only the blossom of the coal was exposed at elevation 3735′ B., but according to Ward and Calain a thickness of 2′ 0″ had been previously uncovered, without certainty of having the full section.

West Virginia Improvement Company Prospect, Reger Opening—No. 362 on Map II.

On northwestern slope of Big Knob of Shavers Mountain facing Taylor Run 2 miles northeast of Bowden; **Sewell Coal**; elevation, 3190′ B.

Found 2′ 0″ of coal; later completed by B. J. Coberly and reported as 4′ 0″ of clean coal.

West Virginia Improvement Company Prospect, Reger Opening—No. 363 on Map II.

On west side of Big Knob of Shavers Mountain facing Shavers Fork 1.5 miles east of Bowden; **Sewell Coal**; elevation, 3285′ B.

				Ft.	In.
1.	Shale, dark			30	0
2.	Sandstone			2	0
3.	Shale, dark			1	6
4.	Coal, soft	0′	2″		
5.	Shale, gray	0	2		
6.	Coal, soft	1	8		
7.	Shale, gray	0	8		
8.	Coal, soft	1	3		
9.	Bone	1	0	4	11
10.	Concealed			2	0
11.	Sandstone, massive, pebbly				

At the above locality the coal was opened and measured in a small ravine with the help of B. J. Coberly but it was too much weathered for sampling. At a later date Mr. Coberly and others dug into the coal 20 feet south of the original prospect with the following results:

				Ft.	In.
1.	Soil, with chunks of coal				
2.	Coal, soft	0′	6″		
3.	Shale, gray	0	1		
4.	Coal, soft	0	6		
5.	Shale, gray, 0′ 5″ to	0	7		
6.	Coal, soft	1	1		
7.	Coal, bony	0	7	3	4
8.	Sandstone, pavement				

It is evident that this digging did not quite reach the roof. This coal, also, was too much weathered for sampling.

Troy E. Hardman No. 1 Prospect—No. 364 on Map II.

On Shavers Mountain facing Dry Fork 0.9 mile east of Flint; Sewell Coal; elevation, 3425′ B.

				Ft.	In.
1.	Shale, Hartridge, dark, sandy			15	0
2.	Coal, soft, columnar	3′	6″		
3.	Coal, bony	0	6	4	0
4.	Shale, gray, pavement				

A sample (No. 732R) was collected from No. 2 of section, 15 feet from the entrance, the composition of which is published under Mine No. 364 in the Table of Coal Analyses at the end of this Chapter.

Troy E. Hardman No. 2 Prospect—No. 365 on Map II.

On Shavers Mountain facing Shavers Fork 0.8 mile northeast of Flint; Sewell Coal; elevation, 3425′ B.

				Ft.	In.
1.	Shale, Hartridge, dark, sandy			15	0
2.	Coal, soft	3′	3″		
3.	Coal, bony	0	9	4	0
4.	Shale, hard, pavement				

The **Troy E. Hardman No. 3 Prospect (No. 366 on Map II)**, on Shavers Mountain facing Shavers Fork 0.8 mile northeast of Flint and just north of No. 2, showed about 1′ 0″ of coal at elevation 3425′ B., but had not been driven to the roof. The **Troy E. Hardman No. 4 Prospect (No. 367 on Map II)**, on Shavers Mountain facing Shavers Fork 0.9 mile northeast of Flint, measured 1′ 3″ of coal at elevation 3440′ B., but had not been driven to the roof. The **Troy E. Hardman No. 5 Prospect (No. 368 on Map II)**, on Shavers Mountain facing Shavers Fork one mile northeast of Flint, measured 1′ 4″ of coal at elevation 3455′ B., but had not been driven to the roof. The **Troy E. Hardman No. 6 Prospect (No. 369 on Map II)**, on Shavers Mountain facing Shavers Fork 1.1 miles northeast of Flint, measured 1′ 6″ of coal at elevation 3465′ B., but had not been driven to the roof.

Two samples of coal, collected by Mr. Hardman on this property from a new opening farther to the southeast, in January, 1928, show the following analyses according to Kaplan:

	Sample No. 1. (Short Can). Per cent.	Sample No. 2. (Tall Can). Per cent.
Moisture	0.96	0.50
Volatile Matter	22.24	22.30
Fixed Carbon	70.28	70.78
Ash	6.52	6.42
Totals	100.00	100.00
Sulphur	0.58	0.62
B. T. U.	14,183	14,200
Fusing Point of Coal Ash	2,900° F.	2,900° F.

Thompson Coal Company Prospect—No. 370 on Map II.

On Shavers Mountain facing Shavers Fork 0.8 mile southeast of Montes; **Sewell Coal**; elevation, 3270′ B.

				Ft.	In.
1.	Sandstone, Lower Guyandot, shaly and shelving, with tree stems, Sigillaria				
2.	Coal, soft	3′	1″		
3.	Coal, bony	0	5	3	6
4.	Shale, pavement				

Thompson Coal Company Prospect—No. 371 on Map II.

On Shavers Mountain facing Shavers Fork 1.2 miles southeast of Montes; **Sewell Coal**; elevation, 3310' B.

		Ft.	In.
1.	**Sandstone, Lower Guyandot,** shaly and shelving	20	0
2.	**Shale, Hartridge,** dark, with fossil plants	4	0
3.	**Coal,** soft	2	0
4.	Shale, gray, pavement		

Thompson Coal Company Prospect—No. 372 on Map II.

On Shavers Mountain facing Shavers Fork 1.4 miles northeast of Bemis; **Sewell Coal**; elevation, 3400' B.

		Ft.	In.
1.	**Shale, Hartridge,** dark	10	0
2.	**Coal,** soft	3	2
3.	Bone, pavement		

A sample (No. 719R) was collected from No. 2 of section at the face about 50 feet from the entrance, the composition of which is published under **Mine No. 372** in the Table of Coal Analyses at the end of this Chapter. Here the coal is dipping northwestward at about 4°.

Thompson Coal Company Prospect—No. 373 on Map II.

On Shavers Mountain facing Shavers Fork 1.1 miles northeast of Bemis; **Sewell Coal**; elevation, 3285' B.

				Ft.	In.
1.	**Shale, Hartridge,** dark, visible			1	0
2.	**Coal,** soft, good	4'	3"		
3.	**Coal,** bony	0	5	4	8
4.	Shale, pavement				

Thompson Coal Company Prospect—No. 374 on Map II.

On Shavers Mountain facing Shavers Fork 0.9 mile northeast of Bemis; **Sewell Coal**; elevation, 3265' B.

				Ft.	In.
1.	**Sandstone, Lower Guyandot,** shelving, with large fossil tree trunks at base			15	0
2.	Slate, bony			0	3
3.	**Coal,** soft	3'	2"		
4.	**Coal,** bony	0	4	3	6
5.	Shale, pavement				

Thompson Coal Company Prospect—No. 375 on Map II.

On Shavers Mountain facing Shavers Fork 0.8 mile northeast of Bemis; **Sewell Coal**; elevation, 3255′ B.

				Ft.	In.
1.	**Sandstone, Lower Guyandot,** massive				
2.	**Shale, Hartridge,** dark, 2′ to			3	0
3.	**Coal,** soft, columnar	2′	10″		
4.	**Coal,** bony	0	2	3	0
5.	Shale, gray, pavement				

A sample (No. 677R) was collected from No. 3 of section at the face of the prospect about 50 feet from the entrance, the composition of which is published under **Mine No. 375** in the Table of Coal Analyses at the end of this Chapter. The prospecting of this large tract of land, done by Oren Kelley, Isaac Helmick, and others, has revealed a body of good Sewell Coal lying high up on the slope of Shavers Mountain, the existence of which was hardly suspected until about 1925.

Several openings have been made on the eastern side of the mountain, as follows:

Richard Chaffey Prospect—No. 376 on Map II.

On Shavers Mountain facing Glady Fork 1.6 miles north of Glady; **Sewell Coal**; elevation, 3650′ B.

				Ft.	In.
1.	**Soil**				
2.	**Coal,** soft, clean, reported	3′	11″		
3.	**Coal,** bony	0	5	4	4
4	Fire clay shale, gray, with plant roots			3	0

The face of the coal at the above prospect was concealed by a slide, there being 3′ 0″ of clean coal visible in the side of the open cut and the full thickness being reported by Mr. E. E. Thompson, of Glady, Superintendent for Mr. Chaffey. A sample (No. 722R) was collected from the visible coal in the cut, the composition of which is published under **Mine No. 376** in the Table of Coal Analyses at the end of this Chapter. The analysis shows a coal which is low in sulphur but the ash is higher and the fusing point lower than might be expected had it been possible to get a sample at an unweathered face.

Richard Chaffey Prospect—No. 377 on Map II.

On Shavers Mountain facing Glady Fork 0.4 mile west of Wheeler; **Sewell Coal**; elevation, 3615′ B.

				Ft.	In.
1.	Shale, Hartridge, dark				
2.	Coal, soft, visible, 4′ 3″, reported	4′	7″		
3.	Bone, reported	0	4	4	11
4.	Fire clay shale, gray, with plant fossils, pavement				

A portion of this prospect was concealed by mud, its full exposure being reported by Mr. Thompson. A sample (No. 723R) was collected from the upper 3′ 0″ of the coal, the composition of which is published under Mine No. 377 in the Table of Coal Analyses at the end of this Chapter. Although obtained quite near the surface this sample reveals a very fine grade of coal. The Chaffey property lies directly east of that of the Thompson Coal Company, the dip of the coal being westward toward Shavers Fork. This combined block of coal comprises several hundred acres of excellent fuel, all of which could easily be mined by running a railroad switch northward from Glady Tunnel along the western slope of Shavers Mountain, avoiding the necessity of long and unsatisfactory inclines.

South of Glady one prospect has been made in Dry Fork District, as follows:

Jacob Arbogast Prospect—No. 378 on Map II.

In a gap of Shavers Mountain facing Glady Fork 0.7 mile northwest of Beulah; Sewell Coal; elevation, 3790′ B.

				Ft.	In.
1.	Slate, black				
2.	Coal, soft	1′	6″		
3.	Shale, gray	0	3		
4.	Coal	1	4		
5.	Coal, bony	0	8	3	9
6.	Shale, gray, pavement				

A sample (No. 721R) was collected from Nos. 2 and 4 of section, the composition of which is published under Mine No. 378 in the Table of Coal Analyses at the end of this Chapter. This prospect had not been driven under cover and the face was muddy. The analysis of the coal reflects its weathered and dirty condition. Much better coal should be found a few feet under cover.

In the Stony River and Job Synclines of the northeastern corner of the county only a few openings have been made in the Sewell (Sharon) Coal, but there should be a considerable acreage beneath the Rohrbaugh, Red Creek, Flatrock, and Roaring Plains, as indicated by the structure contours and by such few prospects as have been made. South of these plains it exists in this region only in a few high tops in Rich and Allegheny Mountains.

In this connection the writer feels obliged to correct an apparent misinterpretation of data previously published in the Pendleton County Report of the Survey, partly under the title of "Mauch Chunk Section along Long Run", pages 195-197, and partly under the title of "Mauch Chunk Strata with Coal", pages 283-285. In these references a long and very detailed section is measured on the southern slope of the Roaring Plains and down into the valley of Long Run of Roaring Creek, ascribing a thickness of 1722 feet to the Mauch Chunk Series, and stating that there are fragmental blocks and a talus of Pottsville Conglomerate for 160 feet above the level of the measured section. In examining this stratigraphic record the writer notes that no red shales of any kind are recorded above the level of 3887′ B., but that, on the contrary, these upper beds are composed of gray sandstones, gray shales, and coals, typical of the Allegheny and Pottsville Series of the Pennsylvanian System, and unlike anything known in the Mauch Chunk Series of West Virginia or of any other State in which it occurs. It seems apparent, therefore, that the portion of the section above elevation 3887′ B. does not be'ong in the Mauch Chunk but in the Pottsville and Allegheny instead. It is accordingly revised as follows, first adding the 160 feet of unrecorded strata at the top and continuing in detail down to elevation 3887′ B., but not repeating the detailed descriptions of red shales, sandstones, and limestones which are recorded below this level but which have no bearing on the occurrence of coals:

Long Run of Roaring Creek Section.

Union District, Pendleton County; on north side of Long Run next to Roaring Plains about 1½ miles west of mouth of Long Run and four miles north of Onego; measured with aneroid by John L. Tilton; revised and reinterpreted by David B. Reger; arranged in descending stratigraphic order.

	Thickness.		Total.	
	Ft.	In.	Ft.	In.
Allegheny Series and Kanawha Group of Pottsville Series (325′ 4″+)				
1. Unrecorded, with sandstone talus	160	0	160	0
2. Largely concealed, apparently shaly	80	0	240	0
3. Shale, gray, clayey	30	0	270	0
4. Sandstone, Upper Connoquenessing, white	10	0	280	0
5. Shale, gray, clayey	45	0	325	0
6. Coal, Quakertown, good, (4235′ B.)	0	4	325	4

		Thickness. Ft.	In.	Total. Ft.	In.
	Pottsville Series—New River Group (358′ 2″)				
7.	Shale, dark, clayey	35	0	360	4
8.	**Coal,** poor ......0′ 6″ } **Hughes Ferry**				
9.	**Coal,** good ......2 1 } (4197′ B.)	2	7	362	11
10.	Shale, black, clayey	0	6	363	5
11.	**Sandstone, Harvey,** coarse, gray, and gray shale (4159′ B.)	38	0	401	5
12.	**Coal, Castle,** good, but irregular; many plant remains (4158′ B.)	0	9	402	2
13.	Shale, gray, clayey	48	0	450	2
14.	**Coal, Sewell (Sharon),** with 0′ 2″ shaly parting through center; many plant remains (4108′ B.)	2	5	452	7
15.	Shale, gray, clayey	8	0	460	7
16.	**Coal, Welch,** bony (4100′ B.)	0	4½	461	0
17.	Shale, dark-gray, clayey	10	0	471	0
18.	Shale, black, clayey, many plant remains	60	0	531	0
19.	**Sandstone, Upper Raleigh (Sharon),** brownish and gray	90	0	621	0
20.	**Coal,** clean, roof good; many plant remains ...... 1′ 7″ } **Fire Creek** (3926′ B.)				
21.	Shale, dark, clayey .....12 0 }	13	11	634	11
22.	**Coal** .... 0 4 }				
23.	Shale, gray, clayey	23	0	657	11
24.	**Coal, Little Fire Creek** (3902′ B.)	0	7	658	6
25.	Shale, gray above, black below, clayey	5	0	663	6
26.	Sandstone, gray (3877′ B.)	20	0	683	6
	Mauch Chunk Series (1198′ 6″)				
27.	Shales, mostly reddish, some gray, sandstones, limestones, etc.; details now omitted	1198	6	1882	0

The above interpretation of this section is now in harmony with the coal strata which outcrop in the same basin in the vicinity of Laneville on the waters of Red Creek just north of the Roaring Plains and which could not possibly thin out and disappear or be carried into the air on the south side of the mountain, as the distance is only a few miles and the structure is controlled by observations which the writer has himself taken in the valleys of Seneca Creek, Roaring Creek, and Long Run itself, although he did not examine in the field the coal-bearing portion of this section.

The following openings and prospects have been noted in the vicinity of Laneville, partly in Tucker and partly in Randolph County:

Robert Bridges Heirs Prospect—No. 379.

(Not on Map II of Randolph County, but indicated on Map II of Tucker County as No. 124).

Dry Fork District, Tucker County; on Little Stonecoal Run of Red Creek 0.9 mile above mouth and 2 miles northeast of Laneville; Sewell Coal; elevation, 3260' B.

				Ft.	In.
1.	Shale, Hartridge, dark, sandy, with plant fossils			20	0
2.	Coal, soft	0'	4"		
3.	Slate, dark	0	4		
4.	Coal	0	2½		
5.	Slate, dark, bony	0	2½		
6.	Coal, soft	0	8	1	9
7.	Shale, dark, pavement				

A sample (No. 456R) was collected from Nos. 2, 4, and 6 of section, the composition of which is published under Mine No. 379 in the Table of Coal Analyses at the end of this Chapter.

Robert Bridges Heirs Prospect—No. 380.

(Not on Map II of Randolph County but indicated on Map II of Tucker County as No. 125).

Dry Fork District, Tucker County; on Stonecoal Run of Red Creek one mile above mouth and three miles northeast of Laneville; Sewell Coal; elevation, 3225' B.

		Ft.	In.
1.	Shale, Hartridge, dark, fissile, with marine fossils (pelecypods and brachiopods)	18	0
2.	Coal, soft	1	8
3.	Shale, sandy		

A sample (No. 454R) was collected from No. 2 of section, the composition of which is published under Mine No. 380 in the Table of Coal Analyses at the end of this Chapter.

Robert Bridges Heirs Exposure—No. 380A.

(Not on Map II of Randolph County but indicated on Map II of Tucker County as No. 126).

Dry Fork District, Tucker County; on Red Creek 4.1 miles northeast of Laneville; Sewell Coal; elevation, 3175' B.

				Ft.	In.
1.	Shale, Hartridge, sandy, with iron nodules			9	0
2.	Coal	0'	8"		
3.	Shale, dark, sandy	9	0		
4.	Coal, slaty, 0' 2" to	1	3	10	11
5.	Shale, sandy				

Robert Bridges Heirs Farm Mine, Elmer White Opening—No. 381 on Map II.

Dry Fork District, Randolph County; along mountain road north of South Fork of Red Creek 2.8 miles southeast of Laneville; Sewell Coal; elevation, 3440′ B.

				Ft.	In.
1.	Sandstone, Lower Guyandot, white, massive				
2.	Coal, soft, good	2′	2″		
3.	Coal, bony	0	6	2	8
4.	Shale, bony, visible			3	0

A sample (No. 710R) was collected from No. 2 of section, at the face, 65 feet from the entrance, the composition of which is published under Mine No. 381 in the Table of Coal Analyses at the end of this Chapter. Mr. White has lately made this opening to supply coal for local domestic use, operating under a lease from the Bridges Estate. When the writer was examining this territory in 1919 for the preparation of the Tucker County Report only a trifling blossom of the coal was visible at the roadside, being listed as No. 128 on the Tucker County Map.

Robert Bridges Heirs Prospect—No. 382 on Map II.

Dry Fork District, Randolph County; on South Fork of Red Creek 3.5 miles southeast of Laneville; Sewell Coal; elevation, 3590′ B.

		Ft.	In.
1.	Sandstone, Lower Guyandot, massive, visible	5	0
2.	Shale, Hartridge, black, with plant and marine fossils	15	0
3.	Coal, soft	2	10
4.	Fire clay shale	1	0
5.	Concealed to creek	10	0

A sample (No. 451R) was collected from No. 3 of section from the exposed face of this prospect which had been merely uncovered for a space along the mountainside, the composition of which is published under Mine No. 382 in the Table of Coal Analyses at the end of this Chapter. The contours of the topographic map at this point show the elevation of the creek as approximately 3900 feet. The elevation of the prospect, however, was taken by aneroid and carefully checked as 3590′ B., and it is the belief of the writer that the topographic contours are slightly wrong.

In the Job Syncline there are apparently three small areas of Sewell (Sharon) Coal remaining in the high tops east and west of Dry Fork. In the top of Haines Knob of Rich Mountain there should be a few acres but so far as known it has not been prospected, although Mr. Lafayette

Judy, of Upper Tract, has opened some coal in this knob since the field work of the writer was concluded. This coal is apparently the Fire Creek, however, as will be later discussed. In the top of Brierpatch Mountain of Allegheny, east of Hazelwood, there should be some Sewell Coal but no account of an opening at this horizon was obtained, although the Fire Creek has been prospected at a lower level in the same mountain.

In Job Knob of Allegheny northeast of Job there is a considerable acreage of Sewell Coal and in 1919 or 1920, or thereabouts, its mining on a commercial basis was undertaken by the Tory Camp Coal Company, which made several openings and planned to carry the coal to the Central West Virginia and Southern Railroad at Job by means of an aerial conveyor system approximately 7,000 feet long. For reasons not altogether known the project was abandoned before any coal had been shipped. These openings, four in number, and designated by the writer for the sake of convenience as "West", "West Central", "East Central", and "East", respectively, are as follows:

Warren Cunningham Mine, West Opening of Tory Camp Coal Co.—No. 383 on Map II.

On south side of Job Knob 1.1 miles northeast of Job; Sewell Coal; elevation, 3990′ B.

			Ft.	In.
1. Sandstone, massive				
2. Coal, soft, 1′ 4″ to	2′	9″		
3. Bone	0	2	2	11
4. Shale, gray, pavement				

The above opening showed very good coal at the entrance but gradually decreased under the mountain until it was only 1′ 4″ at the face.

Warren Cunningham Mine, West Central Opening of Tory Camp Coal Co.—No. 384 on Map II.

On south side of Job Knob just east of West Opening and 1.2 miles northeast of Job; Sewell Coal; elevation, 3990′ B.

			Ft.	In.
1. Sandstone, Lower Guyandot, white, massive			15	0
2. Coal, soft, good, 1′ 0″ to	2′	7″		
3. Bone	0	3	2	10
4. Shale, gray, pavement				

Near the entrance the coal shows the maximum section but farther back the bottom bone and shale thicken and reduce the thickness of clean coal to only 1′ 0″ at the face which is 100 feet from the outcrop. A sample (No. 701R) was taken from No. 2 of section, 30 feet from the entrance and from 2′ 7″ of clean coal, the composition of which is published under Mine No. 384 in the Table of Coal Analyses at the end of this Chapter.

Warren Cunningham Mine, East Central Opening of Tory Camp Coal Co.—No. 385 on Map II.

On south side of Job Knob just east of West Central Opening and 1.2 miles northeast of Job; Sewell Coal; elevation, 4020′ B.

	Ft.	In.
1. Sandstone, Lower Guyandot, white, massive		
2. Coal, good	1	4
3. Shale, gray, pavement		

The above measurement was made at the face, 50 feet from the entrance.

Warren Cunningham Mine, East Opening of Tory Camp Coal Co.—No. 386 on Map II.

On south side of Job Knob just east of East Central Opening and 1.3 miles northeast of Job; Sewell Coal; elevation, 4025′ B.

	Ft.	In.
1. Sandstone, Lower Guyandot, massive		
2. Coal, soft, good	1	6
3. Shale, gray, visible	4	0

The above measurement was made at the face, 50 feet from the entrance. Farther east in the same mountain the following prospect was made in the Sewell by the same company:

Warren Cunningham Prospect, Tory Camp Coal Co. Opening—No. 387 on Map II.

On south side of Job Knob 1.6 miles northeast of Job; Sewell Coal; elevation, 4290′ B.

			Ft.	In.
1. Shale, Hartridge, dark				
2. Coal, soft, good	3′	2″		
3. Coal, slightly bony	0	10	4	0
4. Shale, gray, pavement				

A sample (No. 703R) was collected from No. 2 of section, perhaps 50 feet or more from the entrance but in coal which was wet and muddy by percolation of water through the scant cover, the composition of which is published under **Mine No. 387** in the Table of Coal Analyses at the end of this Chapter. The following opening is farther east on the knob, near the Pendleton County line:

Dr. Decatur Mentoney Prospect—No. 388 on Map II.

On southeast side of Job Knob 1.9 miles northeast of Job; Sewell Coal; elevation, 4400' B.

				Ft.	In.
1.	Shale, Hartridge, dark				
2.	Coal, soft, good	3'	3"		
3.	Coal, bony	0	8	3	11
4.	Shale, gray, pavement				

A sample (No. 704R) was collected from somewhat muddy and rotten coal in No. 2 of section at the face of the prospect only a few feet from the entrance and under scant cover, the composition of which is published under **Mine No. 388** in the Table of Coal Analyses at the end of this Chapter.

Quantity of Sewell (Sharon) Coal Available.

The following table, prepared by Geo. W. Grow from a planimetric measurement of the areas indicated on Figure 28 and correspondingly outcropped on Map II, shows the probable amount of Sewell (Sharon) Coal in Randolph County:

Probable Amount of Sewell (Sharon) Coal.

Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal. (2000 Lbs.)
Roaring Creek	3	74.55	47,712	6,235,004,160	249,400,166
Middle Fork	3	155.50	99,520	13,005,273,600	520,210,944
New Interest	2½	0.725	464	50,529,600	2,021,184
Leadsville	2	8.80	5,632	490,659,840	19,626,394
Beverly	3	9.30	5,952	777,807,360	31,112,294
Valley Bend	3	21.675	13,872	1,812,792,960	72,511,718
Huttonsville	3	43.775	28,016	3,661,130,880	146,445,235
Mingo	3½	39.175	25,072	3,822,477,120	152,899,085
Dry Fork	2½	36.60	23,424	2,550,873,600	102,034,944
Totals		390.10	249,664	32,406,549,120	1,296,261,964

According to records of the State Department of Mines the total coal mined at operations in the Sewell Coal of Randolph County to the end of the calendar year 1928 is 417,988 short tons. This figure indicates that the Sewell Coal has scarcely been touched.

WELCH COAL.

The Welch Coal, previously discussed in Chapter VI, page 272, is generally persistent through a considerable part of the territory of Randolph County where its horizon is contained in the rocks but it is mostly too thin or impure for mining. In Mingo District west of Tygart Valley and in the long hook extending southward into the Elk and Gauley country, however, it becomes a very good, clean coal which should eventually be mined. In a small section of Dry Fork District northeast of Bemis it also thickens to minable proportions but appears to be quite bony so that there is doubt as to the recovery of good coal. Both these areas are indicated on Figure 29 but the coal is not outcropped on Map II as it is only 25 to 60 feet below the Sewell so that its position may be readily interpolated from the latter.

Welch Coal, Roaring Creek District.

In Roaring Creek District the Welch Coal is noted in the Norton Section as 0′ 10″ thick and bony. In the same region the **Gates & Bailey Prospect (No. 389 on Map II)**, on the north end of Rich Mountain facing Tygart River 0.4 mile south of Aggregates, measured only 0′ 6″ at elevation 2655′ B., as recorded in the Aggregates Section, page 150.

Welch Coal, Middle Fork District.

In Middle Fork District the Welch Coal is noted in the **Cassity Fork Boom & Lumber Company No. 2 (17) Coal Test Boring** as only 0′ 6″ thick, as published in the present Chapter.

The coal was once opened at the **Charles E. Daniels Prospect (No. 390 on Map II)**, on the south side of Laurel Branch of Middle Fork River 3.1 miles northeast of Adolph at elevation 2620′ B. When visited by the writer in 1926 the drift was mostly full of water, the thickness being reported as about 3′ 0″ of bony coal and slate.

Welch Coal, Leadsville District.

In Leadsville District the Laurel Ridge Section, page 149, records the Welch Coal horizon as showing only black slate at an old prospect in the gap of Tygart River. In the present Chapter the **Elkins Electric Railway No. 1 (49) Coal Test Boring** notes the coal as 1′ 6″ thick. The following information was obtained at a prospect on Rich Mountain:

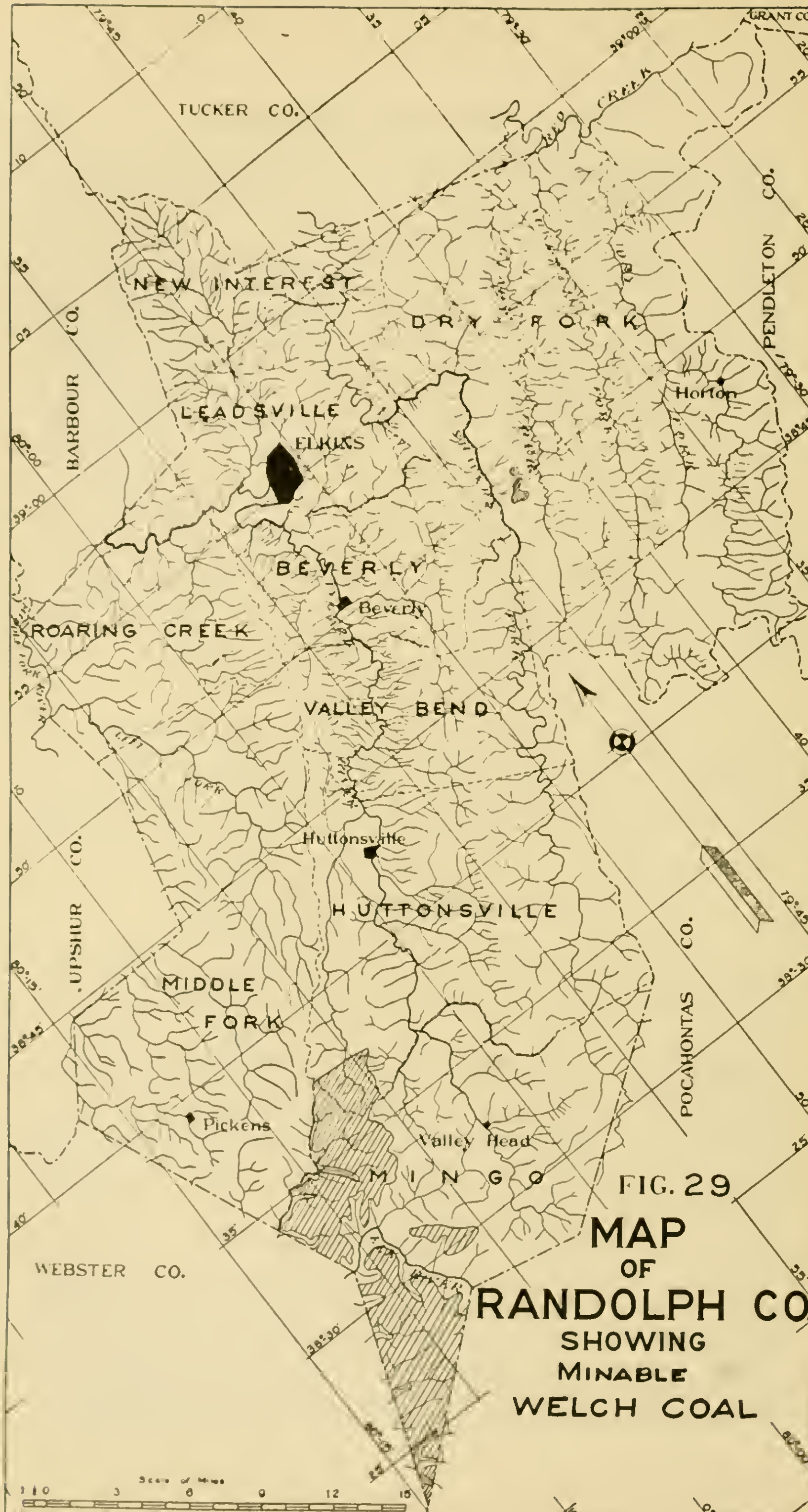


FIG. 29
MAP OF RANDOLPH CO. SHOWING MINABLE WELCH COAL

Loyd Lantz Prospect—No. 391 on Map II.

On east side of Rich Mountain along old county road 0.6 mile south of Aggregates; **Welch Coal**; elevation, 2575′ B.

		Ft.	In.
1.	Sandstone, shaly and flaggy	10	0
2.	Concealed	10	0
3.	**Shale, Hartridge,** dark	7	0
4.	**Coal, Sewell (Sharon), Loyd Lantz or Martin Roy Prospect (No. 279 on Map II),** fallen shut (2615′ B.), reported about	3	0
5.	**Sandstone, Welch,** massive, pebbly	25	0
6.	Concealed	15	0
7.	Black slate and fire clay, **Welch Coal horizon** (2575′ B.), **Loyd Lantz Prospect (No. 391 on Map II),** no coal visible	--	--
8.	Concealed	40	0
9.	**Sandstone, Upper Raleigh (Sharon),** pebbly	20	0
10.	Red shale, top of Mauch Chunk Series		

Welch Coal, Beverly District.

In Beverly District the Welch Coal has been opened at various points in Cheat Mountain. The **Davis Coal Land Company Prospect (No. 392 on Map II),** on the west side of Cheat Mountain facing Right Fork of Files Creek 1.3 miles southeast of Millstone School, is reported as showing 1′ 6″ of coal at elevation 3522′ B., by W. S. Brydon, the place not having been visited by the writer. The **Davis Coal Land Company Prospect (No. 393 on Map II),** on the west side of Cheat Mountain facing Limekiln Run 2.3 miles northeast of Millstone School, is also reported by Mr. Brydon as measuring 1′ 7½″ of coal at elevation 3360′ B. The **Davis Coal Land Company Prospect (No. 394 on Map II),** on the west side of Cheat Mountain facing Left Fork of Files Creek 1.6 miles northeast of Elkhorn School, is reported by Mr. Brydon as measuring 1′ 6″ of coal at elevation 3300′ B. Several prospects have been made in Beverly District on the waters of Shavers Fork, as follows:

Harness Kerns Prospect—No. 395 on Map II.

On west side of Shavers Fork 0.3 mile northwest of Woodrow; **Welch Coal**; elevation, 3210′ B.

				Ft.	In.
1.	Shale, dark			1	0
2.	**Coal**	0′	3″		
3.	Shale, dark	1	1		
4.	**Coal**	1	2	2	6
5.	Shale, gray, pavement				

Harness Kerns Prospect—No. 396 on Map II.

On west side of Shavers Fork 0.6 mile northwest of Flint; Welch Coal; elevation, 3100' B.

				Ft.	In.
1.	Shale, dark, ferruginous			10	0
2.	Coal, bony	0'	3"		
3.	Shale, dark-gray	1	3		
4.	Slate, black, bony	1	3		
5.	Coal, soft	1	7	4	4
6.	Shale, gray, pavement, and concealed			3	0
7.	Sandstone, Upper Raleigh (Sharon), coarse, massive				

The above prospect had fallen partly shut, the section being measured at the outcrop. A sample (No. 733R) was collected from a freshly mined stock pile on the dump, the composition of which is published under Mine No. 396 in the Table of Coal Analyses at the end of this Chapter.

W. L. Camden Prospect—No. 397 on Map II.

On the west side of Upper Pond Lick 0.6 mile west of Flint; Welch Coal; elevation, 3155' B.

				Ft.	In.
1.	Shale, dark			4	0
2.	Coal	0'	5"		
3.	Shale, dark	0	5		
4.	Coal, soft	1	6	2	4
5.	Sandstone, Upper Raleigh (Sharon), massive, pebbly			30	0

W. L. Camden Exposure—No. 398 on Map II.

On north side of Red Creek one mile southwest of Flint; Welch Coal; elevation, 3150' B.

		Ft.	In.
1.	Sandstone, massive, makes cataract	40	0
2.	Concealed, should hold Sewell Coal	25	0
3.	Sandstone, Welch, thick-bedded	15	0
4.	Slate, dark	0	6
5.	Coal, Welch	1	4
6.	Sandstone, massive	7	0
7.	Shale, gray	2	0
8.	Shale, sandy		

W. L. Camden Prospect—No. 399 on Map II.

On south side of Red Creek 0.9 mile southwest of Flint; Welch Coal; elevation, 3030' B.

		Ft.	In.
1.	Sandstone, Welch, shaly	5	0
2.	Shale, dark	4	0
3.	Slate, bony, with a little coal	1	0

W. L. Camden Prospect, Walkers New River Mining Company Opening—No. 400 on Map II.

On east side of Cheat Mountain facing Shavers Fork 0.7 mile southwest of Montes; **Welch Coal**; elevation, 2920′ B.

	Ft.	In.
1. Shale and concealed from Walkers New River Mining Co. Mine in **Sewell Coal** (No. 295 on Map II)	6	0
2. Shale, sandy, ferruginous	3	0
3. **Sandstone, Welch**, shaly	6	0
4. **Coal, Welch**, soft	1	6
5. **Sandstone, Upper Raleigh (Sharon)**, massive		

The roof of the Welch Coal at this prospect contains fossil plants from which Dr. David White and the writer collected **Fossil Lot 404**, the same being shipped to Washington.

At the **Davis Coal Land Company Prospect (No. 401 on Map II)**, on the north side of Fishinghawk Creek 0.4 mile west of Bemis, only a little black slate and coal was found at elevation 2860′ B., as recorded in the Bemis Section, page 161.

Welch Coal, Valley Bend District.

In Valley Bend District little attempt to open the Welch Coal has been made. At the **West Virginia Pulp & Paper Company Exposure (No. 402 on Map II)**, on the eastern face of Cheat Mountain facing Shavers Fork 1.6 miles southwest of Bemis, there is visible 1′ 0″ of lenticular coal at elevation 2956′ B., as recorded in the Cheat Junction Section, page 163.

Welch Coal, Huttonsville District.

In the portion of Huttonsville District west of Tygart Valley only a few prospects have been made in the Welch Coal. The **Ward & Hutton No. 2 (66) Coal Test Boring** records a total section of 8′ 3″ at this horizon but only part of it is coal. The **Lincoln Currence Prospect (No. 403 on Map II)**, on Rich Mountain facing Right Fork of Mill Creek 2.2 miles northeast of Mill Creek town, with an elevation of 2805′ B., had fallen shut, the coal being reported by the owner as 4′ 0″ thick at the outcrop but as thinning out completely farther in the mountain, as recorded in the Mill Creek Section, page 165.

In the Shavers Fork portion of the district the following diamond drill borings record Welch Coal:

West Virginia Pulp & Paper Company No. 1A (50)---2′ 6″
West Virginia Pulp & Paper Company No. 8A (58)---1′ 0″ (bony)
West Virginia Pulp & Paper Company No. 9 (60)----0′ 10″ (bony)

The following exposure was noted near Linan Mine:

West Virginia Pulp & Paper Company Exposure—No. 404 on Map II.

On west side of Shavers Fork 0.5 mile above Yokum Run and 5½ miles north of Cheat Bridge; Welch Coal; elevation, 3402′ B.

	Ft.	In.
1. Sewell Coal at Linan No. 2 Mine (No. 318 on Map II)	5	0
2. Shale and concealed	16	0
3. Coal, Welch, visible in river, about	2	0
4. Sandstone, Upper Raleigh (Sharon), massive, in river		

At the West Virginia Pulp & Paper Company Exposure (No. 405 on Map II), on the west side of Shavers Fork just south of Whitmeadow Run and 3.6 miles north of Cheat Bridge, the Welch Coal is exposed at elevation 3469′ B., with a thickness of 1′ 0″, coming 16 feet below the Sewell Coal, as detailed in the description of Mine No. 319 on Map II, in the latter seam, pages 620-1.

Welch Coal, Mingo District.

In Mingo District west of Tygart Valley the Welch Coal is recorded in the Ward & Hutton No. 1 (67) Coal Test Boring as 1′ 10″ thick. In the same region it was once prospected with good results at the following opening:

Holly Lumber Company Coal Exposure—No. 406 on Map II.

On Back Fork of Elk River, 1.7 miles south of the Parting Springs; Welch Coal; elevation, 2950′ B.

	Ft.	In.
1. Sandstone and concealed		
2. Coal, visible	3	0
3. Fire clay shale and sandstone to river	15	0

This coal comes only a few feet above the red shales of the Mauch Chunk Series as exposed on the north side of the river a short distance westward from this exposure, the Upper Raleigh Sandstone and Fire Creek Coal being evidently absent by unconformity.

At the Davis and Elkins Exposure (No. 407 on Map II), on the State road at the eastern end of Point Mountain two miles east of Monterville the Welch Coal is visible at elevation 3565′ B., with a blossom which is 1′ 0″ thick, as noted in the Valley Head Section, page 171.

So far as known the Welch Coal has not been opened in the long wedge of Randolph County extending southward from Elk River to Three Forks of Gauley, but in the adjacent portion of Webster County lying to the westward there have been some good openings in the ridge between Elk and Gauley Rivers, as previously described in the Report on that county. It is therefore presumed that the same coal should also be present in some quantity in this strip of Randolph County.

Welch Coal, Dry Fork District.

In Dry Fork District various prospects have been made in the Welch Coal, as follows:

Emil Knutti Prospect, Reger Opening—No. 408 on Map II.

On ridge west of Stalnaker Run of Taylor Run 0.9 mile northeast of Bowden; Welch Coal; elevation, 3400′ B.

		Ft.	In.
1.	Concealed from upper coal, (Sewell)	15	0
2.	Coal, Welch	0	9
3.	Shale and sandstone		

At the Thompson Coal Company Prospect (No. 409 on Map II), on the west side of Shavers Mountain facing Shavers Fork one mile south of Montes, there was about 2′ 0″ of bony coal at the Welch horizon at elevation 3250′ B., coming 60 feet by hand-level measurement below Prospect No. 371 in the Sewell Coal and 55 feet by aneroid above Prospect No. 429 in the Fire Creek.

Just to the southward extensive preparations were made in 1926 and 1927 to mine the Sewell Coal but apparently the preliminary heading was driven in the Welch, as indicated by the following data:

Thompson Coal Company Mine—No. 410 on Map II.

On Shavers Mountain facing Shavers Fork 1.1 miles south of Montes; Welch Coal; elevation, 3220′ B.

		Ft.	In.
1.	Shale, dark, sandy	5	0
2.	Sandstone, Welch, shaly	6	0
3.	Shale, dark, with fossil plants	1	0
4.	Coal 0′ 2″		
5.	Shale, dark, bony 1 6 — Welch (Mine No. 410 on Map II)	4	8
6.	Coal, bony 3 0		
7.	Slate, black, bony	2	0
8.	Concealed in bluff	43	0
9.	Sandstone, Upper Raleigh (Sharon), massive	20	0
10.	Coal prospect; Fire Creek Coal, little dark shale on dump (3155′ B.)	--	--
11.	Concealed	85	0
12.	Sandstone, Princeton, massive	25	0
13.	Slate, black, coaly, Pluto Coal of Mauch Chunk Series (3045′ B.)		

Here it is evident that the Welch Coal is 65 feet above the Fire Creek as compared to an interval of 55 feet in the ravine just to the northward where the Sewell, Welch, and Fire Creek are all opened as just previously noted. When driven into the mountain 125 feet the face of the entry showed only 0′ 7″ of hard, blocky, and slaty coal, followed below by 5′ 0″ of dark shale with coaly streaks. An attempt was then made under the writer's direction to find the Sewell in the mountain just above the entry but owing to excessive debris this had not been successful at the time of his last visit in 1927 although it was known to exist in good thickness and quality both to the north and south along the mountain. It has been reported later, however, that the Sewell has been found in minable thickness and quality.

At the above opening Dr. David White and the writer collected Fossil Lot 406 from the plants in or above the Welch Coal, the same being shipped to Washington.

Another prospect in the Welch, slightly farther south, shows the following:

Thompson Coal Company Prospect—No. 411 on Map II.

On Shavers Mountain facing Shavers Fork 1.3 miles south of Montes; Welch Coal; elevation, 3230′ B.

	Ft.	In.
1. Shale, sandy	3	0
2. Coal, bony, laminated and blocky	3	4
3. Shale, black, bony, pavement		

As indicated in the above section the physical appearance of the Welch on this mountain is quite different from that of the Sewell, the latter being soft and having a columnar structure, as contrasted with the hard, laminated, and blocky structure of the Welch.

A few prospects have been made in the Welch on the Chaffey land on the east side of the mountain, as follows:

Richard Chaffey Prospect—No. 412 on Map II.

On Shavers Mountain facing Glady Fork 0.5 mile southwest of Wheeler; Welch Coal; elevation, 3625′ B.

			Ft.	In.
1. Shale, dark, with plant fossils			4	0
2. Coal, soft	2′	2″		
3. Sandstone, hard	0	10		
4. Fire clay shale	0	8		
5. Coal	0	8	4	4
6. Shale, pavement				

A short distance away this coal apparently splits into two benches, as shown by the following prospect:

Richard Chaffey Prospect—No. 413 on Map II.

On Shavers Mountain facing Glady Fork 0.3 mile west of Wheeler; Welch Coal; elevations, as below.

		Ft.	In.
1.	Sandstone, Welch, massive	4	0
2.	Fire clay shale	1	0
3.	Coal, upper bench (3585′ B.)	1	6
4.	Concealed	10	0
5.	Sandstone, massive, coarse	2	0
6.	Fire clay shale, hard, indurated, with lenses of sandstone and plant fossils	2	0
7.	Coal, bony, lower bench (3570′ B.)	1	0
8.	Fire clay shale, pavement		

In the Laneville region the Welch Coal was not found but at the Warren Cunningham Prospect, Tory Camp Coal Company Opening (No. 414 on Map II), on the south side of Job Knob of Allegheny Mountain 1.5 miles northeast of Job, it was found at elevation 4200′ B., coming 40 feet above the Fire Creek and 90 feet below the Sewell. This place had fallen shut, but, according to Guy Cunningham, measured about 1′ 0″.

Quantity of Welch Coal Available.

The following table, prepared by Geo. W. Grow from an interpolated measurement of the areas indicated on Figure 29, shows the probable amount of minable Welch Coal in the county. It does not appear that the area and tonnage indicated for Dry Fork District, however, will furnish coal that is at present acceptable in commerce but its thickness appears to be such that some use may eventually be found for this type of coal:

Probable Amount of Welch Coal.

Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal. (2000 Lbs.)
Huttonsville	2	3.60	2,304	200,724,480	8,028,979
Mingo	3	25.95	16,608	2,170,333,440	86,813.338
Dry Fork	2	0.95	608	52.968,960	2,118,758
Totals		30.50	19,520	2,424,026,880	96,961,075

FIRE CREEK COAL.

The Fire Creek Coal, previously discussed in Chapter VI, pages 275-6, is a soft, double-bedded seam, varying in thickness from one to five feet and principally occurring in the Shavers Fork Valley between Bemis and Cheat Bridge and in the Job and Stony River Basins of the northeastern part of the county. West of Tygart Valley it is scarcely found at all. This coal is generally quite high in ash and appears to be far inferior to the Sewell. Figure 30 shows its supposed minable areas, and on Map II it is outcropped for the same territory. Elsewhere its outcrop lines are not shown but it practically coincides with the base of the New River Group which is delineated on the map.

Fire Creek Coal, Beverly District.

In Beverly District the following Fire Creek prospects were noted:

Harness Kerns Prospect—No. 417 on Map II.

On the head of Lower Pond Lick of Shavers Fork one mile northwest of Woodrow; Fire Creek Coal; elevation, 3305' B.

	Ft.	In.
1. Sandstone, thick-bedded	10	0
2. Coal, rotten	1	6
3. Fire clay shale, gray		

The above prospect had fallen shut, the section being measured at the mouth of the entry.

W. L. Camden Prospect—No. 418 on Map II.

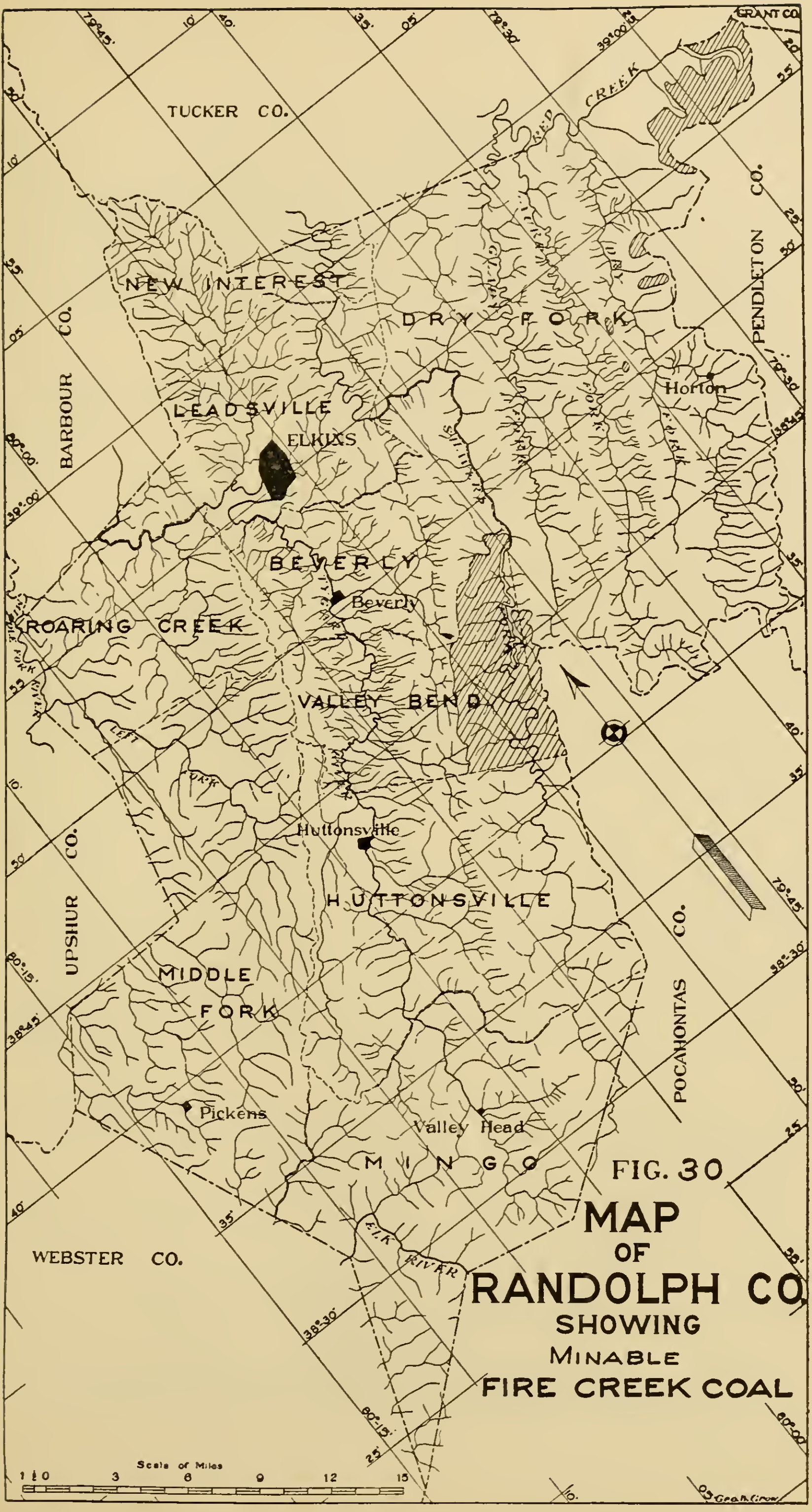
On Cheat Mountain facing Shavers Fork 0.9 mile southwest of Montes; Fire Creek Coal; elevation, 2875' B.

	Ft.	In.
1. Shale, dark	4	0
2. Coal, soft	0	9
3. Shale, pavement		

Davis Coal Land Company Prospect—No. 419 on Map II.

On Cheat Mountain facing Shavers Fork along old Bemis Railroad grade (now a county road) 0.6 mile northwest of Bemis; Fire Creek Coal; elevation, 2850' B.

			Ft.	In.
1. Shale				
2. Coal, slaty	1'	0"		
3. Shale, dark	3	0		
4. Coal, bony	1	6	5	6
5. Slate, black, bony			1	0
6. Sandstone, Princeton				



TUCKER CO.
BARBOUR CO.
UPSHUR CO.
WEBSTER CO.
POCAHONTAS CO.
PENDLETON CO.
GRANT CO.
NEW INTEREST
DRY FORK
LEADSVILLE
ELKINS
BEVERLY
Beverly
ROARING CREEK
VALLEY BEND
Huttonsville
HUTTONSVILLE
MIDDLE FORK
Pickens
Valley Head
MINGO
Horton
RED CREEK
LEFT FORK
ELK RIVER
Scale of Miles
FIG. 30
MAP OF RANDOLPH CO. SHOWING MINABLE FIRE CREEK COAL

Fire Creek Coal, Valley Bend District.

In Valley Bend District several openings have been made along Shavers Fork above Bemis and for a brief time the coal was once mined but the place has been temporarily abandoned. The following prospects and mines were observed or reported:

West Virginia Pulp & Paper Company Prospect—No. 420 on Map II.

On Cheat Mountain facing Shavers Fork 1.6 miles southwest of Bemis; Fire Creek Coal; elevation, 2879' B.

			Ft.	In.
1. Shale, dark			3	0
2. Coal, platy	0'	5"		
3. Coal, soft, columnar	1	8	2	1
4. Concealed, with dark shale			31	0
5. Limestone, Pluto, to red beds			1	0

A sample (No. 224R) was collected from Nos. 2 and 3 of section, at the open face of this shallow digging, the composition of which, on a moisture-free basis, is reported as follows by chemists of the company:

	Per cent.
Volatile Matter	24.92
Fixed Carbon	63.16
Ash	11.92
Total	100.00
Sulphur	0.66
B. T. U.	13,269

West Virginia Pulp & Paper Company Prospect—No. 421 on Map II.

On west side of Shavers Fork just north of Red Roaring Run 2.2 miles southwest of Bemis; Fire Creek Coal; elevation, 2860' B.; section and elevation reported by W. S. Brydon.

	Ft.	In.
1. Slate, black, laminated		
2. Coal	2	0
3. Fire clay, pavement		

West Virginia Pulp & Paper Company Exposure—No. 422 on Map II.

On east side of Shavers Fork 0.3 mile southeast of Red Run and 3.4 miles southwest of Bemis; Fire Creek Coal; elevation, 2955' B.

		Ft.	In.
1.	Sandstone, Upper Raleigh (Sharon), massive		
2.	Coal blossom	2	0
3.	Shale, sandy, and sandstone	10	0
4.	Shale, red, to Western Maryland Railway grade	15	0

West Virginia Pulp & Paper Company, Deer Lick Mine—No. 423 on Map II.

On east side of Shavers Fork opposite Fall Run and 4 miles southwest of Bemis; Fire Creek Coal; elevation, 2985' B.

				Ft.	In.
1.	Shale, dark, with stems of fossil plants, roof				
2.	Coal, medium-hard, blocky	1'	4½"		
3.	Bone coal	0	0½		
4.	Coal, medium-hard	0	10		
5.	Bone, hard	0	5		
6.	Coal, soft	1	0	3	8
7.	Shale, hard, pavement, and concealed, with sandstone to Western Maryland Railway grade			30	0
8.	Concealed			20	0
9.	Sandstone, Princeton, massive, in river, visible			10	0

A sample (No. 747R) was collected from Nos. 2, 3, 4, and 6 of section, in a right-hand room off the main heading about 400 feet from the entrance, the composition of which is published under Mine No. 423 in the Table of Coal Analyses at the end of this Chapter.

At this locality the dip at the mine mouth is about 2° westward but naturally increases toward Shavers Mountain. This mine has been closed for several years, having been operated only in 1923 and 1924, according to the State Department of Mines. On the dump there is a considerable pile of black slate, presumably from the roof shale, with many fossil plant stems.

West Virginia Pulp & Paper Company Exposure—No. 424 on Map II.

On east side of Shavers Fork 0.3 mile southeast of Stalnaker Run and about 6 miles southwest of Bemis; Fire Creek Coal; elevation, 3110' B.

		Ft.	In.
1.	Sandstone, Upper Raleigh (Sharon), massive, pebbly; makes cliff	60	0
2.	Coal, slaty at top, 0' 0" to	2	0
3.	Shale, dark, carbonaceous, with coal and plant stems	15	0
4.	Sandstone, greenish-gray, coarse, massive, micaceous, to river	15	0

Fossil Lot 450 was collected from No. 3 of this section, consisting of the full cross-section of a Sigillaria measuring 1′ 8″ in diameter and standing upright when found in the shales, indicating growth in place. This specimen is now in Morgantown.

Fire Creek Coal, Huttonsville District.

In the part of Huttonsville District touching the valley of Shavers Fork, Fire Creek Coal was found at the following diamond drill borings:

West Virginia Pulp & Paper Co. No. 1A (50) --------	1′	2″
West Virginia Pulp & Paper Co. No. 14 (65) --------	1′	5″

At the West Virginia Pulp & Paper Company Exposure (No. 425 on Map II), on the east side of Shavers Fork 0.4 mile above Red Run and 1.4 miles north of Cheat Bridge, the blossom of the coal is visible at elevation 3545′ B., along the Western Maryland Railway grade and just above the red shales.

In the portion of the district west of Tygart Valley no prospects have been made in the Fire Creek and it apparently does not exist in a considerable part of this territory. In the Ward & Hutton No. 2 (66) Coal Test Boring, however, it is noted as 3′ 2″ thick.

Fire Creek Coal, Mingo District.

In Mingo District the blossom of the Fire Creek Coal is visible at elevation 3530′ B., along the State road at the eastern end of Point Mountain, as recorded in the Valley Head Section, page 171, but apparently the coal has small thickness. The Ward & Hutton No. 1 (67) Coal Test Boring records it as 7′ 5″ thick, with considerable shale. It is not apparent that minable Fire Creek Coal will be found in this district.

Fire Creek Coal, Dry Fork District.

In Dry Fork District the Fire Creek Coal has been opened at various points in Shavers Mountain near Bemis where it has no great thickness; and it seems to occur with considerable regularity in the Job and Stony River Basins where it has considerable thickness but is split by a shale parting and is rather high in ash. The following prospects and exposures, partly in the Otter Creek country of Tucker County, closely adjacent to Randolph, have been observed:

Arnold Estate Prospect—No. 426 on Map II.

Black Fork District, Tucker County; on west side of Dry Fork 0.8 mile northeast of Otter Station; **Fire Creek Coal**; elevation, 2700′ B.

Fallen shut; not much found; comes at top of red shale.

Otter Creek Boom & Lumber Company Prospect—No. 427 on Map II.

Dry Fork District, Tucker County; on Green Mountain facing Dry Fork 0.8 mile west of Moores Siding; **Fire Creek Coal**; elevation, 2830′ B.

	Ft.	In.
Fallen shut, reported	1	8

On Shavers Mountain in the Bemis country, the following prospects have been made:

Thompson Coal Company Prospect—No. 428 on Map II.

On Shavers Mountain facing Shavers Fork 0.8 mile southeast of Montes; **Fire Creek Coal**; elevation, 3175′ B.

	Ft.	In.
1. **Sandstone, Upper Raleigh (Sharon)**, with fossil tree stems		
2. **Coal, reported**	3	6

The above opening had fallen shut, its thickness being reported by Isaac Helmick, who made it.

Thompson Coal Company Prospect—No. 429 on Map II.

On Shavers Mountain facing Shavers Fork one mile southeast of Montes; **Fire Creek Coal**; elevation, 3195′ B.

			Ft.	In.
1. **Sandstone, Upper Raleigh (Sharon)**, massive, coarse				
2. **Coal**, soft	1′	4″		
3. Bone	0	2	1	6
4. Shale, pavement				

The attempt to open Fire Creek Coal down the slope of Shavers Mountain below the projected mine opening of the Thompson Coal Company has already been noted along with the description of **Mine No. 410 on Map II**, page 655. At this point little or no Fire Creek Coal was found.

At the **Thompson Coal Company Prospect (No. 430 on Map II)**, on Shavers Mountain facing Shavers Fork 1.3 miles south of Montes, there was 1′ 8″ of clean coal at elevation 3165′ B., coming just beneath the Upper Raleigh (Sharon) Sandstone.

Thompson Coal Company Prospect—No. 431 on Map II.

On Shavers Mountain facing Shavers Fork 0.7 mile northeast of Bemis; Fire Creek Coal; elevation; 3160′ B.

				Ft.	In.
1.	Sandstone, Upper Raleigh (Sharon), coarse, massive			20	0
2.	Concealed			10	0
3.	Coal, reported	0′	6″		
4.	Shale, reported	1	0		
5.	Coal, reported	0	6	2	0

This prospect had fallen shut but the thickness was reported by Isaac Helmick, who made it.

Richard Chaffey Prospect—No. 432 on Map II.

On Shavers Mountain 1.0 mile northeast of Bemis; Fire Creek Coal; elevation, 3560′ B.

		Ft.	In.
1.	Sandstone, Upper Raleigh (Sharon), massive		
2.	Coal, clean, reported	2	0

This prospect had fallen shut, its thickness being reported by E. E. Thompson, who made it.

The Richard Chaffey Prospect (No. 433 on Map II), on Shavers Mountain 1.1 miles northeast of Bemis at elevation 3565′ B., had fallen shut but the coal was reported by E. E. Thompson as having a total thickness of 2′ 0″ with a fire clay parting.

In the Laneville country of the Stony River Basin, the coal is visible at the following point in Tucker County:

Robert Bridges Heirs Prospect—No. 434.

(Not shown on Map II of Randolph County but indicated on Tucker County Map as No. 135).

Dry Fork District, Tucker County; on Stonecoal Run of Red Creek 0.8 mile above mouth of run and 2.9 miles northeast of Laneville; Fire Creek Coal; elevation, 3115′ B.

				Ft.	In.
1.	Sandstone, Upper Raleigh (Sharon), massive			40	0
2.	Coal, good	0′	4″		
3.	Slate, bony	0	5		
4.	Coal, bony	2	6		
5.	Slate, bony	0	4		
6.	Coal, bony	1	3	4	10
7.	Shale, pavement				

A sample (No. 453R) was collected from Nos. 2, 4, and 6 of section, the composition of which is published under

Mine No. 434 in the Table of Coal Analyses at the end of this Chapter. As might be expected from the description, the ash content is extremely high.

On the Randolph County side of the line the blossom of the coal was observed at the **Robert Bridges Heirs Coal Exposure (No. 435 on Map II)**, on the South Fork of Red Creek 3.5 miles southeast of Laneville at elevation 3430′ B., but its thickness could not be measured.

In the same basin on the southern slope of the Roaring Plains facing Long Run of Roaring Creek about four miles north of Onego, Union District, Pendleton County, Dr. John L. Tilton reports a coal which the writer regards as the Fire Creek, as indicated by Nos. 20-22 of the Long Run of Roaring Creek Section (revised), published on page 643 of the present Report. Here there is a bench of 1′ 7″ of clean coal at the top, followed below by 12 feet of shale and 0′ 4″ of coal, at elevation 3926′ B.

In the Job Syncline the Fire Creek Coal has been opened at several points, as follows:

Lelia M. Mauzy Prospect—No. 436 on Map II.

On the northwest side of Brierpatch Mountain of Allegheny Mountain facing Dry Fork 1.3 miles east of Hazelwood; **Fire Creek Coal**; elevation, 4045′ B.

	Ft.	In.
1. **Sandstone, Upper Raleigh** (Sharon), white, massive, cliff rock, old panther-den rocks	50	0
2. Shale, dark	2	0
3. **Coal**, extremely bony, mostly slate	3	0
4. Concealed, pavement?		

Lelia M. Mauzy, Tory Camp Coal Co. Opening—No. 437 on Map II.

On north side of Job Knob of Allegheny Mountain facing Tony Camp Run of Dry Fork two miles northeast of Job; **Fire Creek Coal**; elevation, 4230′ B.

			Ft.	In.
1. Soil				
2. **Coal**, soft, good	1′	6″		
3. Shale, dark	0	1		
4. **Coal**	0	10		
5. Shale, dark	0	1		
6. **Coal**, soft, good	1	4	3	10
7. Shale, gray, pavement				

The above prospect had fallen shut, being measured at the mouth of the entry. According to Mr. McDaniels, of the

Tory Camp Coal Company, the total at the face was 4′ 6″, as reported by him to Guy Cunningham.

Warren Cunningham Prospect, Tory Camp Coal Co. Opening —No. 438 on Map II.

On south side of Job Knob of Allegheny Mountain 1.5 miles northeast of Job; Fire Creek Coal; elevation, 4160′ B.

				Ft.	In
1.	Sandstone, Upper Raleigh (Sharon)				
2.	Shale			0	3
3.	Coal, soft	3′	3″		
4.	Slate	0	1		
5.	Coal, soft	1	5	4	9
6.	Shale, pavement				

A sample (No. 702R) was collected from Nos. 3 and 5 of section, at the face of the prospect which had been driven a considerable distance into the mountain, the composition of which is published under Mine No. 438 in the Table of Coal Analyses at the end of this Chapter. The analysis reveals a coal somewhat high in ash but otherwise fairly good.

Judy Brothers Prospect—No. 439 on Map II.

On Haines Knob of Rich Mountain facing Dry Fork one mile southwest of Job; Fire Creek Coal; elevation, 4060′ B.

	Ft.	In
Fallen shut, reported	3	0

This opening had fallen shut, its thickness being reported by Marvin White, a tenant. Since field work was completed the owners have done some additional prospecting toward the northeastern end of the knob, according to Mr. Lafayette Judy, of Upper Tract, finding 3′ 6″ of coal with some slate. A sample, furnished by Mr. Judy from weathered and dirty coal near the outcrop, shows the following analysis, according to Kaplan and Sigwart:

		Per cent.
Moisture		8.08
Volatile Matter		25.54
Fixed Carbon		56.11
Ash		10.27
Total		100.00
Sulphur		0.59
B. T. U.	10,500	

The weathered condition of this sample is very evident from the moisture content. If driven to solid coal beneath the mountain the B. T. U. content should rise to about 13,000.

Quantity of Fire Creek Coal Available.

The following table, prepared by Geo. W. Grow from a planimetric measurement of the areas indicated on Figure 30 and delineated by outcrop on Map II, indicates the probable amount of Fire Creek Coal that appears to be of thickness that may eventually be minable. Most of this coal is high in ash, however, and is very patchy, so that it can scarcely be considered of much present value:

Probable Amount of Fire Creek Coal.

Districts.	Thickness of Coal Assumed. Feet.	Square Miles.	Acres.	Cubic Feet of Coal.	Short Tons of Coal. (2000 Lbs.)
Valley Bend	1½	24.70	15,808	1,032,894,720	41,315,789
Dry Fork	2	16.35	10,464	911,623,680	36,464,947
Totals	---	41.05	26,272	1,944,518,400	77,780,736

According to records of the State Department of Mines only 18,070 short tons of Fire Creek Coal have been mined in Randolph County.

SUMMARY OF AVAILABLE COAL.

For convenience of reference practically all the mines, prospects, and exposures described in this Report have been given serial numbers which are printed in blue on Map II, there being in each case a conventional mine symbol indicating the exact location. Disregarding those which apply to coals having no commercial significance, the following table, compiled by Geo. W. Grow, gives a list of the numbers which refer to the 15 commercial coal seams described in the present Chapter, as well as a summary of the total coal that each seam is estimated to contain.

This table represents the amount of coal believed to have been available in the county before mining began. At the end of 1928 there had been 18,680,590 short tons mined and by the end of the year 1930 this figure will have reached about 20,000,000 short tons, with the probability that an additional amount of 5,000,000 tons may have been lost in mining. Deducting 25,000,000 tons from the original total of 4,183,643,819

Summary of Available Coal by Districts in Randolph County (in tons of 2,000 pounds).

Coal Bed.	Mines and Prospects Listed on Map II and Described in Chapter X.	DISTRICTS.									Total
		Roaring Creek.	Middle Fork.	New Interest.	Leadsville.	Beverly.	Valley Bend.	Huttonsville.	Mingo.	Dry Fork.	
Bakerstown (Thomas)	....	....	....	....	....	....	....	....	....	6,412,320	6,412,320
Upper Freeport	....	....	....	....	....	....	....	....	....	14,301,619	14,301,619
Upper Kittanning	Nos. 1-2	26,595,994	....	....	....	....	....	....	....	....	26,595,994
Middle and Lower Kittanning	Nos. 3-36	159,910,502	10,872,576	....	22,414,234	....	....	....	....	....	193,197,312
Clarion	Nos. 37-42	55,756,800	....	....	27,878,400	....	....	....	....	....	83,635,200
Upper Mercer	Nos. 43-54	127,125,504	38,472,192	....	....	....	....	....	....	....	165,597,696
Lower Mercer (Stockton)	Nos. 55-59	....	34,457,702	....	....	....	....	....	....	....	34,457,702
Quakertown (Winifrede?)	Nos. 60-65	3,345,408	30,331,699	....	....	....	....	1,895,731	....	....	35,572,838
Campbell Creek (Peerless)	Nos. 74-120	72,037,786	204,906,240	....	....	7,917,465	12,963,456	13,660,416	10,175,616	....	321,660,979
Eagle	Nos. 128-145	15,388,877	229,494,989	....	....	8,028,979	12,963,456	26,651,750	17,842,176	182,952	310,553,179
Gilbert	Nos. 146-157	....	257,317,652	....	....	10,119,859	18,901,555	59,046,451	41,887,296	....	387,272,793
Hughes Ferry	Nos. 162-194	81,181,901	327,292,416	501,811	55,757	12,712,550	26,930,534	48,508,416	56,593,152	49,135,680	602,912,217
Castle	Nos. 197-216	25,341,465	336,771,072	....	....	14,719,795	32,952,269	63,479,117	52,188,365	5,018,112	530,470,195
Sewell (Sharon)	Nos. 232-388	249,400,166	520,210,941	2,021,184	19,626,394	31,112,294	72,511,718	146,445,235	152,899,085	102,034,944	1,296,261,964
Welch	Nos. 389-414	....	....	....	....	....	....	8,028,979	86,813,338	2,118,758	96,961,075
Fire Creek	Nos. 417-439	....	....	....	....	....	41,315,789	....	....	36,464,947	77,780,736
Totals	....	816,084,403	1,990,127,462	2,522,995	69,974,785	84,610,942	218,538,777	367,716,095	418,399,028	215,669,332	4,183,643,819

tons, there will remain 4,158,643,819 tons yet to be recovered. On the basis of 80 per cent. recovery, which should be averaged in coming operations, there will remain 3,326,915,055 short tons (of 2,000 pounds) which the operators may expect to take from the ground before the coal is finally exhausted:

MINABLE COALS BY MAGISTERIAL DISTRICTS.

The minable coals of the county, as so classified in this Report, have been described by magisterial districts on previous pages of this Chapter. In the Index at the end of the Report, under the heading "Minable Coals by Magisterial Districts", will be found a list of page references making this information available without further discussion.

TABLE OF COAL ANALYSES.

The following table, compiled by Geo. W. Grow, containing the proximate, and in many cases the ultimate, analyses of 93 mines and prospects, together with calorific determinations, fuel ratios, carbon ratios, and fusing points of ash, is the exclusive work of members of the Survey Staff. All samples were taken by the writer, or by former staff members, in the field, those from commercial mines being cut on a large cloth, mixed, pulverized, and quartered until the coal remaining filled a small tin can, in which it was hermetically sealed. Samples from prospects or remote openings where standard equipment could not be taken were collected in small bags with as much care as was possible.

The chemical work was mainly done by B. B. Kaplan, Chief Chemist of the Survey, with the help of Harry J. Sigwart and Lee M. Morris, Assistant Chemists, certain analyses taken from previous reports having been made by former chemists of the Survey. All this work has been done in the laboratory of the Survey at Morgantown. In this connection it should be noted that a considerable lapse of time, amounting in some instances to nearly four years, occurred between the sampling and analysis of the coals. In some of the samples there has been an apparent loss of moisture in storage, this condition being more evident in the bag samples than in those preserved in cans.

In addition to the analyses given in the table, a few others are published on preceding pages, along with descriptions of the mines from which the samples were taken, the same being furnished by mine owners or other interested parties. These are doubtless quite as accurate as those to be found in the Survey table, but it is thought best to present them separately.

In the Survey table below, the numbers on the left-hand margin correspond to the numbers given with the descriptions of the mines and with the symbols on Map II. All the samples were cut from the mining sections of the seams, unless otherwise described, the usual method being to discard from the samples such slates or other impurities as would be rejected in ordinary commercial shipment:

Table of Coal Analyses.

(Under "Condition of Sample", "A. D." = air dried; "A. R." = as received).

No. on Map II.	Mine.	Coal Bed.	Condition of Sample	Proximate. Moisture.	Proximate. Volatile Matter.	Proximate. Fixed Carbon.	Proximate. Phosphorus.	Common to Both. Ash.	Common to Both. Sulphur.	Ultimate. Carbon.	Ultimate. Hydrogen.	Ultimate. Oxygen.	Ultimate. Nitrogen.	Calorimeter B. T. U. for 1 lb. of Coal.	Calculated B. T. U. for 1 lb. of Coal.	Fusing Point of Ash, °F.	Fuel Ratio (Carbon Divided by Oxygen + Ash).	Carbon Ratio (Fixed Carbon Divided by Sum of F. C. & V. M.) Per Cent.
..	Robert Bridges Heirs, Mine....	Upper Freeport (Davis)	A. R.	1.78	21.31	56.93	0.050	19.98	1.48	67.76	3.85	5.70	1.23	12,100	11,940	.....	2.64	72.76
8	Davis Colliery Co., Sivad No. 5B	M. & L. Kittanning...	A. D.	0.85	32.76	56.68	0.018	9.71	1.62	76.19	4.93	6.31	1.24	13,760	13,710	.....	4.76	63.37
	(Now W. Va. Coal & C. Co.)	M. & L. Kittanning...	A. R.	2.88	32.09	55.52	0.018	9.51	1.59	74.63	5.05	8.01	1.21	13,480	13,430	.....	4.26	63.37
11	Davis Colliery Co., Sivad No. 2	M. & L. Kittanning...	A. D.	1.01	30.76	58.90	0.010	9.33	1.62	76.71	4.95	6.16	1.29	13,700	13,820	.....	4.97	65.69
	(Now W. Va. Coal & C. Co. No. 2)	M. & L. Kittanning...	A. R.	3.29	30.05	57.55	0.010	9.11	1.58	74.94	5.10	8.02	1.25	13,390	13,500	.....	4.37	65.70
15	Davis Colliery Co., Coalton No. 1	M. & L. Kittanning...	A. D.	1.11	30.42	57.21	0.051	11.26	2.05	75.12	4.78	5.55	1.24	13,370	13,540	.....	4.47	65.29
	(Now W. Va. Coal & C. Co. No. 1)	M. & L. Kittanning...	A. R.	2.47	30.01	56.41	0.051	11.11	2.02	74.09	4.87	6.69	1.22	13,190	13,350	.....	4.16	65.27
18	A. Spates Brady	M. & L. Kittanning...	A. D.	0.92	31.17	60.82	0.018	7.09	0.95	79.12	5.23	6.27	1.3	14,270	14,300	.....	5.92	66.12
		M. & L. Kittanning...	A. R.	2.50	30.68	59.84	0.018	6.98	0.93	77.86	5.32	7.59	1.32	14,040	14,080	.....	5.34	66.11
19	J. B. Jenkins Coal & Coke Co...	M. & L. Kittanning...	A. D.	0.99	30.61	59.65	0.049	8.75	1.13	77.24	5.06	6.34	1.48	13,820	13,930	.....	5.12	66.09
		M. & L. Kittanning...	A. R.	2.36	30.19	58.82	0.049	8.63	1.12	76.18	5.14	7.46	1.47	13,630	13,740	.....	4.73	66.08
28	Davis C. & C. Co., Weaver No. 2	M. & L. Kittanning...	A. R.	0.62	29.81	58.29	0.031	11.28	1.63	....	...	....	...	13,785	.....	.....	....	66.16
29	Davis C. & C. Co., Williette Mine	M. & L. Kittanning...	A. D.	0.79	31.56	56.59	0.059	11.06	1.25	76.68	4.46	5.31	1.24	13,510	13,550	.....	4.68	64.20
		M. & L. Kittanning...	A. R.	2.30	31.08	55.73	0.059	10.89	1.23	75.52	4.56	6.58	1.22	13,300	13,340	.....	4.32	64.20
32	Davis Colliery Co., Harding No. 4	M. & L. Kittanning...	A. D.	0.69	30.84	57.97	0.028	10.50	1.94	76.47	4.78	5.11	1.20	13,690	13,760	.....	4.90	65.27
	(Now W. Va. C. & C. Co. No. 3)	M. & L. Kittanning...	A. R.	2.28	30.35	57.04	0.028	10.33	1.91	75.24	4.88	6.46	1.18	13,470	13,540	.....	4.48	65.27
	Average..........	**M. & L. Kittanning**...	A. D.	0.91	31.16	58.26	0.033	9.67	1.51	76.79	4.88	5.86	1.29	13,731	13,801	.....	4.94	65.15
	Average..........	**M. & L. Kittanning**...	A. R.	2.34	30.53	57.40	0.033	9.73	1.50	....	...	....	...	.....	.....	.....	....	65.28
	Average..........	**M. & L. Kittanning**...	A. R.	...	....	....	.....	9.51	1.48	75.49	4.99	7.26	1.27	13,536	13,569	.....	4.50	....
37	Davis C. & C. Co., Leiter Mine..	Clarion	A. R.	0.54	30.82	60.20	0.025	8.44	1.86	....	...	....	...	13,966	.....	.....	....	66.14
45	Maxwell, Arnold, et al., Farm Mine	Upper Mercer	A. R.	0.77	31.93	58.40	0.005	8.90	2.02	....	...	....	...	.....	.....	.....	....	64.65
46	Moore-Keppel & Co., Farm Mine	Upper Mercer	A. R.	0.60	32.52	58.09	0.007	8.79	2.02	....	...	....	...	.....	.....	.....	....	64.11
	Average..........	**Upper Mercer**	A. R.	0.68	32.22	58.25	0.006	8.85	2.02	....	...	....	...	.....	.....	.....	....	64.39
58	Andrew Balli, Farm Mine......	L. Mercer (Stockton)..	A. R.	0.91	34.27	53.17	0.007	11.65	0.73	....	...	....	...	.....	.....	.....	....	60.81
75	Moore-Keppel & Co., Prospect...	Camp. Creek (Peerless)	A. R.	0.80	31.60	56.30	0.005	11.30	0.73	....	...	....	...	.....	.....	.....	....	64.05
85	William Hornbeck, Farm Mine..	Camp. Creek (Peerless)	A. R.	0.80	31.33	65.93	0.006	1.94	0.76	....	...	....	...	.....	.....	.....	....	67.79
88	John Fincham, Farm Mine	Camp. Creek (Peerless)	A. R.	0.55	30.55	67.14	0.001	1.76	0.92	....	...	....	...	.....	.....	.....	....	68.73
92	Ella Brake, Farm Mine	Camp. Creek (Peerless)	A. R.	0.92	33.42	59.30	0.003	6.36	1.37	....	...	....	...	.....	.....	.....	....	63.96
104	James Pickens, Prospect	Camp. Creek (Peerless)	A. R.	0.80	33.70	59.92	0.004	5.58	0.74	....	...	....	...	.....	.....	.....	....	64.00
114	Casper Winkler, Farm Mine....	Camp. Creek (Peerless)	A. R.	1.32	33.88	63.02	0.004	1.78	0.69	....	...	....	...	.....	.....	.....	....	65.04

Table of Coal Analyses, (Continued).

(Under "Condition of Sample", "A. D." = air dried; "A. R." = as received).

No. on Map II.	Mine.	Coal Bed.	Condition of Sample	Proximate. Moisture.	Proximate. Volatile Matter.	Proximate. Fixed Carbon.	Proximate. Phosphorus.	Common to Both. Ash.	Common to Both. Sulphur.	Ultimate. Carbon.	Ultimate. Hydrogen.	Ultimate. Oxygen.	Ultimate. Nitrogen.	Calorimeter B. T. U. for 1 lb. of Coal.	Calculated B. T. U. for 1 lb. of Coal.	Fusing Point of Ash, °F.	Fuel Ratio (Carbon Divided by Oxygen + Ash).	Carbon Ratio (Fixed Carbon Divided by Sum of F. C. & V. M.) Per Cent.
120	W. Va. Pulp & Paper Co., Farm Mine	Camp. Creek (Peerless)	A. R.	1.05	25.00	69.25	0.009	4.70	1.60	79.64	5.72	7.43	0.91	14,720	14,620	......	6.57	73.47
	Average	**Camp. Creek (Peerless)**	A. R.	0.89	31.36	62.98	0.0046	4.77	0.97	....	...	....	...	.....	.....	......	....	66.76
129	Lloyd Zickefoose, Farm Mine	Eagle	A. R.	1.60	30.20	62.80	0.003	5.40	1.84	....	...	....	...	.....	.....	......	....	67.53
135	James Shannon, Farm Mine	Eagle	A. R.	2.30	32.50	60.94	0.002	4.26	0.67	....	...	....	...	.....	.....	......	....	65.22
144	John Gimmel, Farm Mine	Eagle	A. R.	0.92	32.77	61.17	0.001	5.14	0.74	....	...	....	...	.....	.....	......	....	65.12
	Average	**Eagle**	A. R.	1.61	31.82	61.64	0.002	4.93	1.08	....	...	....	...	.....	.....	......	....	65.95
155	W. Va. P. & P. Co., Hopkins Mine	Gilbert	A. D.	0.38	26.82	56.01	.....	16.79	1.05	....	...	....	...	12,800	.....	2925+	....	67.62
166	Henry Moats (Buey Coffman), Farm Mine	Hughes Ferry	A. R.	0.87	31.12	54.38	0.008	13.63	0.85	....	...	....	...	.....	.....	......	....	63.60
168	Joseph Currence, Farm Mine	Hughes Ferry	A. R.	0.83	31.23	57.94	0.010	10.00	1.70	....	...	....	...	.....	.....	......	....	64.98
170	Elkhorn Coal Corp., Prospect	Hughes Ferry	A. R.	0.71	31.32	66.65	0.001	1.32	0.67	....	...	....	...	.....	.....	......	....	68.03
189	Otter Creek Boom & Lumber Co., Prospect	Hughes Ferry	A. R.	0.90	25.11	71.19	0.002	2.80	0.66	86.52	5.07	3.62	1.33	15,330	15,480	......	13.48	73.93
190	Otter Creek Boom & Lumber Co. Mine	Hughes Ferry	A. R.	1.00	24.25	47.26	0.009	27.49	1.00	....	...	....	...	.....	.....	......	....	66.10
	Average	**Hughes Ferry**	A. R.	0.86	28.61	59.48	0.006	11.05	0.98	....	...	....	...	.....	.....	......	....	67.60
205	Walkers New River Mining Co., Prospect (W. L. Camden Land)	Castle	A. R.	3.76	21.66	69.31	0.0059	5.27	1.13	....	...	....	...	12,660	.....	2060	....	76.19
212	Davis & Elkins, Farm Mine (Geo. B. Swecker, Opening)	Castle	A. R.	0.90	28.20	66.30	.....	4.60	0.66	....	...	....	...	14,715	.....	2810	....	70.16
	Average	**Castle**	A. R.	2.33	24.93	67.81	.....	4.93	0.89	....	...	....	...	13,688	.....	2435	....	73.12
233	Claude W. Maxwell, Farm Mine	Sewell	A. D.	0.54	29.16	63.80	0.0062	6.50	0.70	80.10	4.97	6.45	1.28	14,445	14,262	2330	6.19	68.63
238	Grace Hart Johnson, Farm Mine (John Hart Opening)	Sewell	A. R.	0.90	28.10	65.00	....	6.00	0.59	....	...	....	...	14,237	.....	2445	....	69.82
240	Grace Hart Johnson, Farm Mine	Sewell	A. R.	1.26	30.99	63.07	0.05	4.68	0.59	....	...	....	...	.....	.....	......	....	67.05
242	Taylor George, No. 1 Mine	Sewell	A. R.	1.03	29.07	67.03	.....	2.87	0.48	....	...	....	...	14,875	.....	2600	....	69.75
249	Ira Shockey, Farm Mine	Sewell	A. R.	1.00	30.00	63.94	0.027	5.06	0.65	....	...	....	...	.....	.....	......	....	68.06
250	J. A. Enlow, Farm Mine	Sewell	A. R.	0.91	30.46	64.23	0.019	4.40	2.23	....	...	....	...	.....	.....	......	....	67.83
253	Moore-Keppel & Co., Prospect	Sewell	A. R.	1.26	27.54	57.44	0.009	13.76	0.48	....	...	....	...	.....	.....	......	....	67.59
255	R. O. Zirkle, Farm Mine	Sewell	A. R.	1.00	28.80	60.87	0.005	9.33	0.52	....	...	....	...	.....	.....	......	....	67.88

Table of Coal Analyses, (Continued).

(Under "Condition of Sample", "A. D." = air dried; "A. R." = as received).

No. on Map II.	Mine.	Coal Bed.	Condition of Sample	Proximate. Moisture.	Proximate. Volatile Matter.	Proximate. Fixed Carbon.	Proximate. Phosphorus.	Common to Both. Ash.	Common to Both. Sulphur.	Ultimate. Carbon.	Ultimate. Hydrogen.	Ultimate. Oxygen.	Ultimate. Nitrogen.	Calorimeter B. T. U. for 1 lb. of Coal.	Calculated B. T. U. for 1 lb. of Coal.	Fusing Point of Ash, °F.	Fuel Ratio (Carbon Divided by Oxygen + Ash).	Carbon Ratio (Fixed Carbon Divided by Sum of F. C. & V. M.) Per Cent.
258	William D. Currence, Farm Mine	Sewell	A. R.	0.95	30.80	61.17	0.019	7.08	0.63	....	...	....	...	.....	.....	.....	....	66.51
260	Three Fork Coal Co., Cassity	Sewell	A. D.	0.74	26.40	68.54	.....	4.32	0.59	80.74	5.16	8.05	1.14	14,695	14,349	2875	6.53	72.19
	Mine	Sewell	A. R.	2.93	25.82	67.03	.....	4.22	0.58	78.96	5.28	9.85	1.11	14,370	13,925	2875	5.61	72.19
261	Arthur Shiflett, Farm Mine	Sewell	A. R.	0.72	30.18	63.95	0.043	5.15	0.66	....	...	....	...	.....	.....	.....	....	67.94
264	Emil Metzner, Farm Mine	Sewell	A. R.	0.63	32.95	61.20	0.005	5.22	1.46	....	...	....	...	.....	.....	.....	....	65.90
267	Elkhorn Coal Corporation, Beech Camp Mine	Sewell	A. R.	0.53	32.95	62.62	0.002	3.90	0.66	....	...	....	...	.....	.....	.....	....	65.52
272	Ranwood Lumber Co., Welsh Colony Mine	Sewell	A. R.	0.67	29.56	65.35	0.008	4.42	0.56	....	...	....	...	.....	.....	.....	....	68.85
277	L. L. Bennett, Farm Mine (J. B. Ward, Jr., Opening)	Sewell	A. R.	0.80	33.50	61.20	.....	4.50	1.04	....	...	....	...	14,758	.....	2473	....	64.63
284	James Baker, Prospect, Reger Opening	Sewell	A. R.	0.95	26.00	64.63	.....	8.42	1.08	....	...	....	...	13,840	.....	2459	....	71.31
286	W. D. Althouse, Prospect, John Purkey Opening	Sewell	A. D.	0.45	26.60	66.84	.....	6.11	0.92	81.84	4.56	5.37	1.20	14,450	14,345	2503	7.13	71.53
288	W. D. Althouse, Prospect,	Sewell	A. D.	3.05	28.28	63.71	.....	4.96	0.72	72.41	5.02	15.91	0.98	12,250	12,443	2420	3.47	69.26
	John Purkey Opening	Sewell	A. R.	6.33	27.31	61.55	.....	4.81	0.69	69.95	5.21	18.39	0.95	11,833	12,000	2420	3.02	69.27
289	Davis Coal Land Co., Prospect, John Purkey Opening	Sewell	A. D.	0.41	25.57	65.79	.....	8.23	0.94	78.86	5.08	5.74	1.15	14,250	14,136	2895	5.64	72.01
294	W. L. Camden, Prospect	Sewell	A. R.	1.70	21.30	71.62	.....	5.38	0.60	....	...	....	...	13,868		2810	....	77.08
295	Walkers New River Mining Co.,	Sewell	A. D.	1.20	22.70	73.20	.....	2.90	0.56	85.11	4.91	5.19	1.33	15,004	15,027	2650	10.52	76.32
	Big Sewell No. 1 Mine	Sewell	A. R.	4.96	21.83	70.42	.....	2.79	0.54	81.86	5.14	8.40	1.27	14,430	14,653	2650	7.32	76.34
298	W. L. Camden, Prospect	Sewell	A. R.	0.34	24.66	71.25	.....	3.75	0.65	....	...	....	...	14,485	.....	2459	....	74.29
300	Davis Coal Land Co., No. 1 Mine	Sewell	A. D.	0.66	23.40	71.94	0.0059	4.00	0.68	82.84	5.33	6.00	1.15	14,937	14,937	2417	8.28	75.46
		Sewell	A. R.	0.92	23.32	71.77	0.0059	3.99	0.68	82.61	5.34	6.23	1.15	14,892	14,874	2417	8.08	75.48
303	Davis Coal Land Co., Mine	Sewell	A. R.	0.40	23.60	72.38	.....	3.62	0.53	....	...	....	...	15,052	.....	2459	....	75.41
305	Monsarrat & Co., Inc., Mine	Sewell	A. D.	0.58	23.42	72.00	0.0059	4.00	0.46	83.02	5.15	6.25	1.12	14,744	14,787	2635	8.10	75.46
		Sewell	A. R.	8.30	21.60	66.41	0.0054	3.69	0.42	76.57	5.61	12.69	1.02	13,600	13,657	2635	4.67	75.46
308	W. Va. Pulp & Paper Co., Big	Sewell	A. D.	0.60	25.30	66.80	0.006	7.30	0.61	79.14	5.09	6.76	1.10	14,143	14,173	2750	5.63	72.53
	John Mine	Sewell	A. R.	2.50	24.81	65.53	0.006	7.16	0.59	77.63	5.20	8.34	1.08	13,870	13,718	2750	5.01	72.54
312	John F. Nydegger, Prospect	Sewell	A. R.	1.80	24.50	62.35	.....	11.35	0.70	....	...	....	...	13,650	.....	3000	....	71.79

Table of Coal Analyses, (Continued).

(Under "Condition of Sample", "A. D." = air dried; "A. R." = as received).

No. on Map II.	Mine.	Coal Bed.	Condition of Sample	Proximate.				Common to Both.		Ultimate.				Calorimeter B. T. U. for 1 lb. of Coal.	Calculated B. T. U. for 1 lb. of Coal.	Fusing Point of Ash, °F.	Fuel Ratio (Carbon Divided by Oxygen + Ash).	Carbon Ratio (Fixed Carbon Divided by Sum of F. C. & V. M.) Per Cent.
				Moisture.	Volatile Matter.	Fixed Carbon.	Phosphorus.	Ash.	Sulphur.	Carbon.	Hydrogen.	Oxygen.	Nitrogen.					
313	H. G. Davis Heirs (Now Moore-Keppel & Co.) Tolbard & Spiker Mine	Sewell	A. R.	0.40	26.00	61.22	0.015	12.38	0.55	77.76	4.24	3.95	1.12	13,615	13,531	......	4.76	70.19
318	W. Va. Pulp & Paper Co., Linan No. 2 Mine..........	Sewell	A. D.	0.40	25.50	66.30	0.006	7.80	0.61	79.00	5.08	6.24	1.27	14,573	14,184	2850	5.63	72.22
320	W. Va. Pulp & Paper Co.,	Sewell	A. R.	2.47	24.97	64.92	0.006	7.64	0.60	77.36	5.20	7.96	1.24	14,270	13,871	2850	4.96	72.22
	Whitmeadow Mine	Sewell	A. D.	0.33	26.14	59.44	.....	14.09	1.48	72.10	4.86	6.54	0.93	13,157	13,064	2882	3.49	69.46
322	W. Va. Pulp & Paper Co., Red Run Mine	Sewell	A. D.	0.22	27.04	57.75	.....	14.99	1.33	72.00	4.47	6.15	1.06	12,765	12,826	2900	3.41	68.11
324	W. Va. Pulp & Paper Co., Farm Mine, Club House Opening..	Sewell	A. D.	0.40	30.58	61.30	.....	7.72	0.86	79.40	5.21	5.63	1.18	14,420	14,421	2848	5.95	66.72
326	Croft Lumber Co., Mine	Sewell	A. R.	0.66	30.13	61.73	0.019	7.48	0.98	....	...	....	...	.....	.....	......	....	67.20
329	Croft Lumber Co., Mine	Sewell	A. R.	0.38	30.03	65.39	.....	4.20	0.89	....	...	....	...	14,335	.....	2950	....	68.53
330	Wm. Vandevender Heirs, Farm Mine	Sewell	A. R.	0.84	30.79	64.73	0.002	3.64	1.25	....	...	....	...	.....	.....	.....	....	67.77
333	Davis & Elkins, Farm Mine, Geo. B. Swecker Opening...	Sewell	A. R.	0.85	27.85	63.60	.....	7.70	0.81	....	...	....	...	14,000	.....	2717	....	69.55
336	Hale & Kinney, Farm Mine....	Sewell	A. R.	2.36	33.04	61.13	0.003	3.47	0.71	....	...	....	...	.....	.....	......	....	64.91
338 B	Pardee & Curtin Lumber Co., Robt. Rose Opening.......	Sewell	A. R.	0.66	29.07	63.67	0.010	6.60	0.71	....	...	....	...	.....	.....	.....	....	68.65
338 C	Pardee & Curtin Lumber Co., Prospect	Sewell	A. R.	2.52	31.59	59.36	0.012	6.53	0.56	....	...	....	...	.....	.....	......	....	65.27
341	W. Va. Pulp & Paper Co., Isom Folks Opening	Sewell	A. R.	1.21	29.51	66.64	0.011	2.64	0.81	....	...	....	...	.....	.....	......	....	69.31
344	Adam Phillips, Prospect	Sewell	A. R.	0.91	24.20	63.86	0.038	11.03	0.33	....	...	....	...	.....	.....	......	....	72.52
355	Ward & Triplett, Prospect	Sewell	A. D.	0.32	23.88	71.25	.....	4.55	0.57	82.80	5.27	5.65	1.16	14,940	14,902	2445	8.12	74.90
		Sewell	A. R.	4.46	22.89	68.29	.....	4.36	0.56	79.36	5.51	9.10	1.11	14,320	14,284	2445	5.90	74.90
356	J. B. Ward, Jr., Prospect, Reger Opening	Sewell	A. R.	0.25	25.79	68.23	.....	5.73	0.55	....	...	....	...	14,470	.....	2671	....	72.57
358	Emil Knutti, Prospect, Reger Opening	Sewell	A. R.	4.33	26.74	61.24	.....	7.69	0.49	....	...	....	...	11,935	.....	2459	....	69.61

Table of Coal Analyses, (Concluded).

(Under "Condition of Sample", "A. D." = air dried; "A. R." = as received).

No. on Map II.	Mine.	Coal Bed.	Condition of Sample	Proximate.				Common to Both.		Ultimate.				Calorimeter B. T. U. for 1 lb. of Coal.	Calculated B. T. U. for 1 lb. of Coal.	Fusing Point of Ash, °F.	Fuel Ratio (Carbon Divided by Oxygen + Ash).	Carbon Ratio (Fixed Carbon Divided by Sum of F. C. & V. M.) Per Cent.
				Moisture.	Volatile Matter.	Fixed Carbon.	Phosphorus.	Ash.	Sulphur.	Carbon.	Hydrogen.	Oxygen.	Nitrogen.					
360	Forest Glen Land Co., Prospect	Sewell	A. R.	1.45	26.90	66.55	.....	5.10	0.68	....	...	....	...	14,164	.....	......	....	71.21
364	Troy E. Hardman, No. 1 Prospect	Sewell	A. D.	1.76	23.56	66.04	.....	8.64	0.55	76.84	5.15	7.72	1.10	13,454	13,685	2850	4.70	73.71
		Sewell	A. R.	7.58	22.19	62.09	.....	8.14	0.52	72.36	5.53	12.41	1.04	12,670	12,908	2850	3.52	73.67
372	Thompson Coal Co., Prospect	Sewell	A. R.	0.32	21.53	72.45	.....	5.70	0.61	....	...	....	...	14,725	.....	2750	....	77.09
375	Thompson Coal Co., Prospect	Sewell	A. R.	1.85	21.25	65.00	.....	11.90	0.51	....	...	....	...	13,040	.....	2810	....	75.36
376	Richard Chaffey, Prospect	Sewell	A. R.	1.35	25.80	64.07	.....	8.78	0.60	....	...	....	...	12,782	.....	2515	....	71.29
377	Richard Chaffey, Prospect	Sewell	A. R.	3.75	25.65	67.25	.....	3.35	0.51	....	...	....	...	12,656	.....	2810	....	72.39
378	Jacob Arbogast, Prospect	Sewell	A. R.	3.18	23.67	59.17	.....	13.98	0.59	....	...	....	...	11,094	.....	2250	....	71.43
379	Robert Bridges Hrs., Prospect	Sewell	A. R.	1.05	19.07	73.09	0.022	6.79	0.60	....	...	....	...	.....	.....	......	....	79.31
380	Robert Bridges Hrs., Prospect	Sewell	A. R.	0.82	18.20	66.83	0.012	14.15	2.79	....	...	....	...	.....	.....	......	....	78.60
381	Robert Bridges Hrs., Elmer White Opening	Sewell	A. R.	0.39	17.05	62.90	.....	19.66	0.98	....	...	....	...	12,425	.....	2750	....	78.67
382	Robert Bridges Hrs., Prospect	Sewell	A. R.	0.82	18.99	60.93	0.007	19.26	2.71	69.94	3.86	3.25	0.98	12,680	12,430	......	3.11	76.24
384	Warren Cunningham, Mine, West Central Opening of Tory Camp Coal Co.	Sewell	A. R.	2.35	19.85	60.90	.....	16.90	0.41	....	...	....	...	11,630	.....	2850	....	75.42
387	Warren Cunningham, Prospect, Tory Camp Coal Co. Opening	Sewell	A. R.	2.00	21.60	64.30	.....	12.10	0.69	....	...	....	...	12,750	.....	2810	....	74.85
388	Dr. Decatur Mentoney, Prospect	Sewell	A. R.	4.70	23.30	53.70	.....	18.30	0.39	....	...	....	...	9,927	.....	2800	....	69.74
	Average	**Sewell**	A. D.	0.78	25.83	66.31	0.006	7.08	0.77	79.08	5.02	6.91	1.14	14,148	14,103	2683	5.65	71.97
	Average	**Sewell**	A. R.	1.86	26.10	64.53	0.0144	7.51	0.77	....	...	....	...	.....	.....	......	....	71.20
	Average	**Sewell**	A. R.	...	....	....	.....	7.13	0.77	76.76	5.10	9.14	1.10	13,492	13,623	2658	4.72	....
396	Harness Kerns, Prospect	Welch	A. R.	1.62	23.61	62.37	.....	12.40	0.62	....	...	....	...	12,880	.....	2728	....	72.54
423	W. Va. Pulp & Paper Co.,	Fire Creek	A. D.	0.31	22.91	67.09	.....	9.69	0.65	77.65	5.11	5.64	1.26	13,892	14,038	2860+	5.07	74.54
	Deer Lick Mine	Fire Creek	A. R.	0.67	22.62	67.06	.....	9.65	0.65	77.15	5.13	6.16	1.26	13,842	13,961	2860+	4.88	74.78
434	Robert Bridges Heirs, Prospect	Fire Creek	A. R.	0.90	18.08	39.97	0.029	41.05	0.37	....	...	....	...	.....	.....	......	....	68.85
438	Warren Cunningham, Prospect, Tory Camp Coal Co.	Fire Creek	A. R.	2.30	22.10	61.40	.....	14.20	0.49	....	...	....	...	12,000	.....	2800+	....	73.53
	Average	**Fire Creek**	A. R.	1.29	20.93	56.15	0.029	21.63	0.50	....	...	....	...	12,921	.....	2830	....	72.85

Page References to Detailed Descriptions and Sections of Coal Mines Listed in Preceding Table.

No. on Map II.	Sample No.	Coal Bed and Name of Owner.	Location.	Page.
		Upper Freeport (Davis).		
	455-R	Robert Bridges Heirs .... (Not on Map II) (No. 67 on Tucker Co. Map II)	Dry Fork Dist., Tucker Co.; 3.2 mi. N. E. of Laneville..	500
		Middle and Lower Kittanning.		
8	15-T	Davis Colliery Co., Sivad No. 5B (Now W. Va. C. & C. Co.)	0.8 mi. S. W. of Harding......	506
11	14-T	Davis Colliery Co., Sivad No. 2 (Now W. Va. C. & C. Co. No. 2)	0.7 mi. S. of Norton..........	507
15	13-T	Davis Colliery Co., Coalton No. 1 (Now W. Va. C. & C. Co. No. 1)	At Coalton	509
18	17-T	A. Spates Brady	0.7 mi. N. E. of Mable........	511-12
19	16-T	J. B. Jenkins C. & C. Co.	0.3 mi. S. of Mable	512
28	II(A), p. 512	Davis C. & C. Co., Weaver No. 2	At Weaver	516
29	9-T	Davis C. & C. Co., Williette Mine	0.5 mi. N. E. of Weaver on Beaver Creek	517
32	11-T	Davis Colliery Co., Harding No. 4 Mine (Now W. Va. C. & C. Co. No. 3)..........	0.9 mi. N. E. of Harding	518
		Clarion.		
37	B. 2, p. 300	Davis C. & C. Co., Leiter Mine..	0.3 mi. S. of Leiter	523
		Upper Mercer.		
45	239-T	Maxwell, Arnold, et al., Farm Mine	2.8 mi. N. E. of Cassity	526-7
46	241-T	Moore-Keppel & Co., Farm Mine	1.2 mi. S. E. of Cassity	527
		Lower Mercer (Stockton).		
58	159-R	Andrew Balli, Farm Mine	1.8 mi. S. W. of Silica........	531
		Campbell Creek (Peerless).		
75	248 A-T	Moore-Keppel & Co., Prospect	0.5 mi. S. of Ellamore	536
85	248-T	William Hornbeck, Farm Mine	2.2 mi. S. E. of Gale..........	538
88	244-T	John Fincham, Farm Mine	1.6 mi. N. of Adolph	538-9
92	155-R	Ella Brake, Farm Mine	0.9 mi. N. E. of Blue Rock....	540
104	253-T	James Pickens, Prospect	0.3 mi. S. E. of Pickens......	542-3
114	160-R	Casper Winkler, Farm Mine ..	1.0 mi. W. of Parting Springs	544
120	.....	W. Va. Pulp & Paper Co., Farm Mine	1.3 mi. W. of Bemis	545-6
		Eagle.		
129	156-R	Lloyd Zickefoose, Farm Mine..	0.2 mi. E. of Loda	549
135	154-R	James Shannon, Farm Mine ..	1.8 mi. S. E. of Adolph	550
144	254-T	John Gimmel, Farm Mine	0.7 mi. S. of Silica	552
		Gilbert.		
155	......	W. Va. Pulp & Paper Co., Hopkins Mine	0.6 mi. W. of Hopkins	559-60
		Hughes Ferry.		
166	245-T	Henry Moats (Now Buey Coffman), Farm Mine	2.1 mi. N. E. of Adolph	564
168	242-T	Joseph Currence, Farm Mine ..	3 mi. N. E. of Adolph	564
170	251-T	Elkhorn Coal Corporation, Prospect	At Hartridge	565
189	428-R	Otter Creek Boom & Lumber Co., Prospect	0.5 mi. S. of Tucker Co. line on Possession Camp Run....	570
190	426-R	Otter Creek Boom & Lumber Co., Mine	0.4 mi. S. of Devils Gulch of Otter Creek	570-1
		Castle.		
205	731-R	Walkers New River Mining Co., Prospect (W. L. Camden Land)	0.6 mi. S. W. of Montes	576

Page References to Detailed Descriptions and Sections of Coal Mines Listed in Preceding Table, (Continued).

No. on Map II.	Sample No.	Coal Bed and Name of Owner.	Location.	Page.
212	692-R	Davis & Elkins, Geo. B. Swecker Opening	2.1 mi. W. of Monterville	578
		Sewell.		
233	740-R	Claude W. Maxwell, Farm Mine	0.6 mi. W. of Aggregates	584
238	735-R	Grace Hart Johnson, John Hart Opening	2.4 mi. E. of Fisher	585
240	152-R	Grace Hart Johnson, Farm Mine	2.8 mi. S. E. of Fisher	586
242	669-R	Taylor George, No. 1 Mine	2.1 mi. S. E. of Fisher	586
249	247-T	Ira Shockey, Farm Mine	At Long	588
250	246-T	J. A. Enlow, Farm Mine	0.4 mi. N. of Loda	589
253	158-R	Moore-Keppel & Co., Prospect	0.8 mi. N. W. of Cassity	589
255	157-R	R. O. Zirkle, Farm Mine	0.5 mi. N. W. of Cassity	590
258	240-T	William D. Currence, Farm Mine	4.7 mi. S. E. of Cassity	590-1
260	739-R	Three Fork Coal Co., Cassity Mine	0.7 mi. S. W. of Cassity	591-2
261	243-T	Arthur Shiflett, Farm Mine	3.2 mi. N. E. of Adolph	594
264	252-T	Emil Metzner, Farm Mine	1.7 mi. S. E. of Helvetia	595-6
267	249-T	Elkhorn Coal Corporation, Beech Camp Mine	1.6 mi. S. of Beech Run village	597
272	213-R	Ranwood Lumber Co., Welsh Colony Mine	5.0 mi. S. of Pickens	599-600
277	655-R	L. L. Bennett, Farm Mine, J. B. Ward, Jr., Opening	3.4 mi. N. W. of Gilman	602
284	728-R	James Baker, Prospect, Reger Opening	1.6 mi. S. W. of Faulkner	604
286	727-R	W. D. Althouse, Prospect, John Purkey Opening	1.3 mi. S., slightly W., of Faulkner	605
288	726-R	W. D. Althouse, Prospect, John Purkey Opening	1.1 mi. S., slightly W., of Faulkner	605
289	729-R	Davis Coal Land Co., Prospect, John Purkey Opening	1.1 mi. W. of Weese Crossing	606
294	718-R	W. L. Camden, Prospect	1.0 mi. S. W. of Flint	607
295	730-R	Walkers New River Mining Co., Big Sewell No. 1 Mine	0.7 mi. S. W. of Montes	607-8
298	711-R	W. L. Camden, Prospect	1.1 mi. S. W. of Montes	608
300	754-R	Davis Coal Land Co., No. 1 Mine	0.8 mi. W. of Bemis	609-10
303	753-R	Davis Coal Land Co., Mine	1.1 mi. W. of Bemis	610-11
305	774-R	Monsarrat & Co., Inc., Mine	0.9 mi. W. of Bemis	611-12
308	746-R	W. Va. Pulp & Paper Co., Big John Mine	0.6 mi. S. of Stalnaker Run, 5 mi. S. of Cheat Junction	612-13
312	661-R	John F. Nydegger, Prospect	5.0 mi. S. W. of Mill Creek town	614
313	II (A) p. 239	H. G. Davis Hrs. (Now Moore-Keppel & Co.), Tolbard & Spiker Mine	6.0 mi. S. W. of Mill Creek town	615
318	745-R	W. Va. Pulp & Paper Co., Linan No. 2 Mine	0.4 mi. N. of Crouch Run, about 5.5 mi. N. of Cheat Bridge	618-19
320	748-R	W. Va. Pulp & Paper Co., Whitmeadow Mine	0.2 mi. S. of Whitmeadow Run, 3.5 mi. N. of Cheat Bridge	620-1
322	750-R	W. Va. Pulp & Paper Co., Red Run Mine	1.5 mi. N. of Cheat Bridge	621
324	751-R	W. Va. Pulp & Paper Co., Farm Mine, Club House Opening	2.4 mi. N. W. of Blue Spring	622

Page References to Detailed Descriptions and Sections of Coal Mines Listed in Preceding Table, (Concluded).

No. on Map II.	Sample No.	Coal Bed and Name of Owner.	Location.	Page.
326	232-R	Croft Lumber Co. Mine	1.8 mi. S. of the Parting Springs	622-3
329	743-R	Croft Lumber Co. Mine	3.4 mi. N. W. of Monterville	623
330	161-R	William Vandevender Heirs, Farm Mine	2.5 mi. N. W. of Monterville	624
333	691-R	Davis & Elkins Farm Mine, Geo. B. Swecker Opening	2.1 mi. W. of Monterville	625
336	163-R	Hale & Kinney, Farm Mine	2.4 mi. N. W. of Blue Spring	625
338 B	199-R	Pardee & Curtin Lumber Co., Farm Mine, Robt. Rose Opening	Fork Lick Dist., Webster Co.; 4.0 mi. S. E. of Bergoo town	627
338 C	197-R	Pardee & Curtin Lumber Co., Prospect	Fork Lick Dist., Webster Co.; 3.2 mi. S. E. of Bergoo town	627
341	203-R	W. Va. Pulp & Paper Co., Isom Folks Opening	1.5 mi. S. W. of Blue Spring	628-9
344	427-R	Adam Phillips, Prospect	Black Fork Dist., Tucker Co.; 1.0 mi. N. W. of Otter Station	630-1
355	752-R	Ward & Triplett, Prospect	2.5 mi. N. E. of Bowden	634-5
356	725-R	J. B. Ward, Jr., Prospect, Reger Opening	2.1 mi. N. E. of Bowden	635
358	709-R	Emil Knutti, Prospect, Reger Opening	1.0 mi. N. E. of Bowden	635-6
360	667-R	Forest Glen Land Co., Prospect	2.2 mi. N. W. of Bowden	636
364	732-R	Troy E. Hardman, No. 1, Prospect	0.9 mi. E. of Flint	637
372	719-R	Thompson Coal Co., Prospect	1.4 mi. N. E. of Bemis	639
375	677-R	Thompson Coal Co., Prospect	0.8 mi. N. E. of Bemis	640
376	722-R	Richard Chaffey, Prospect	1.6 mi. N. of Glady	640
377	723-R	Richard Chaffey, Prospect	0.4 mi. W. of Wheeler	640-1
378	721-R	Jacob Arbogast, Prospect	0.7 mi. N. W. of Beulah	641
379	456-R	Robert Bridges Heirs, Prospect (Not on Map II)	Dry Fork Dist., Tucker Co.; 2.0 mi. N. E. of Laneville	644
380	454-R	Robert Bridges Heirs, Prospect (Not on Map II)	Dry Fork Dist., Tucker Co.; 3.0 mi. N. E. of Laneville	644
381	710-R	Robert Bridges Heirs, Farm Mine, Elmer White Opening	2.8 mi. N. E. of Laneville	645
382	451-R	Robert Bridges Heirs, Prospect	3.5 mi. S. E. of Laneville	645
384	701-R	Warren Cunningham, Mine, West Central Opening of Tory Camp Coal Co.	1.2 mi. N. E. of Job	646-7
387	703-R	Warren Cunningham, Prospect, Tory Camp Coal Co. Opening	1.6 mi. N. E. of Job	647-8
388	704-R	Dr. Decatur Mentoney, Prospect	1.9 mi. N. E. of Job	648
		Welch.		
396	733-R	Harness Kerns, Prospect	0.6 mi. N. W. of Flint	652
		Fire Creek.		
423	747-R	W. Va. Pulp & Paper Co., Deer Lick Mine	4.0 mi. S. W. of Bemis	661
434	453-R	Robert Bridges Heirs, Prospect (Not on Map II)	Dry Fork Dist., Tucker Co.; 2.9 mi. N. E. of Laneville	664-5
438	702-R	Warren Cunningham, Prospect, Tory Camp Coal Co. Opening	1.5 mi. N. E. of Job	666

CHAPTER XI.

LIMESTONE.

INTRODUCTION.

The limestone resources of Randolph County are so large and important that it seems advisable to assemble the essential data in one Chapter where they may be available in concrete form. In conformity with that idea previous Chapters on Stratigraphy give full descriptions of only those minor calcareous horizons which have little or no commercial significance. Next to the coal, and possibly agricultural soil, limestone is probably the most valuable natural commodity that the county can now offer to the markets of the country, until such time as the mountains can be reforested and the lumber industry be revived.

At many localities the limestones are so situated that they can be quarried with ease but many of the outcrops are isolated and far from trunk-line transportation. At certain strategic points, however, they may be found adjacent to railroads and these points are sufficient in number to permit such development as may be probable for many years in view of market conditions and competition from other regions.

The quality of the various limestones indicates that material is available from which there may be manufactured Portland cement, agricultural and possibly building lime, railroad ballast, concrete aggregate, and possibly other commercial products, but it is not apparent that the county will produce stone for blast-furnace flux or lime for the manufacture of steel, glass, paper, leather, and other products in which an extremely low silica and high calcium carbonate content is demanded.

Limestones in the county are principally confined to the lower part of the Mauch Chunk Series of the Mississippian, the outcrop of which series is shown by Figure 8 and on Map II; to the Greenbrier Series of the Mississippian, the outcrop of which is shown on Figure 9 and on Map II; to the Maccrady Series, the outcrop of which is shown on Figure 10 and on Map II; and to the basal part of the Genesee, the outcrop of which is shown on Figure 14 and on Map II. Of these series the Greenbrier is more important than all the others combined, both in the quantity and quality of its limestone.

The use of local limestone in the county has mainly been confined to road material, concrete aggregate, agricultural lime, and possibly the manufacture of concrete blocks. No attempt has been made to build masonry structures of limestone, since there are few, if any, beds that are well adapted to this purpose.

LIMESTONES OF THE MISSISSIPPIAN PERIOD.

In the Mississippian Period the limestones of consequence, in descending stratigraphic order, are as follows:

- **Mauch Chunk Series—Bluefield Group:**
  - Reynolds
  - Glenray
- **Greenbrier Series:**
  - Alderson
  - Union
    - Gasper Portion
    - Bethel Portion
    - Fredonia Portion
  - Pickaway
  - Taggard
  - Patton
  - Sinks Grove
- **Maccrady Series:**
  - Warsaw.

LIMESTONES OF THE MAUCH CHUNK SERIES.

Reynolds Limestone.

The Reynolds Limestone, previously described on pages 305-6, is a shaly and impure deposit, varying in thickness from 5 to 25 feet and principally occurring in Mingo District, there being isolated exposures in other regions. It is never sufficiently firm to be used as ballast or aggregate and it evidently contains too many impurities for use as agricultural lime. In certain localities, however, it might blend with the higher calcium limes of the Greenbrier Series to make a Portland cement mixture. Unfortunately no samples for chemical analysis were collected.

Glenray Limestone.

The Glenray Limestone, previously described on pages 311-12, is usually dark-gray and shaly or sandy but in the southeastern part of Dry Fork District it becomes pinkish-gray, hard, and fairly pure, with a thickness of 10 to 25 feet. In Leadsville District, it is noted in the Aggregates Section, page 150, as 10 feet thick, dark, and shaly. A sample (No. 654R) was collected on the land of Gates and Bailey (Exposure No. 1 on Map II), the composition of which is published in the Table of Limestone Analyses at the end of this Chapter.

In Beverly District this limestone appears to thicken locally to 104 feet in Pond Lick Mountain above the quarry of the Monongahela Construction Company, as will be detailed in a section published on a subsequent page under the description of the Union Limestone and the quarry of this company. Here it is mostly dark and sandy, two samples (Nos. 673R and 674R) having been collected from it, as published under Exposures Nos. 2 and 3 in the Table of Limestone Analyses at the end of this Chapter. The upper half has a calcium carbonate content of 94.96 per cent., and the lower half 72.73 per cent., indicating that it might be useful for Portland cement material.

In Dry Fork District the Whitmer Section, page 211, records it as 45 feet thick, gray, tinged with pink, hard, and fairly pure. On the land of Osceola Dyer (Exposure No. 4 on Map II), on the west side of Dry Fork near a road fork 5½ miles above the junction of this stream with Gandy Creek it is 25 feet thick, gray, and hard, as will be later detailed in a section showing the Union Limestone on this farm. A sample (No. 712R) was collected from the Glenray, the composition of which is published in the Table of Limestone Analyses at the end of this Chapter. This analysis shows 84.22 per cent. of calcium carbonate.

At the William Adamson Farm, on the western slope of Rich Mountain two miles northwest of Pharis Knob, it is 15 feet thick, gray, pure, and hard, as already detailed in a measured section at this farm, page 333.

Near Osceola, on the southern slope of Yokum Knob, it is gray, pure, and 15 feet thick, as recorded in the Osceola Section, page 212.

LIMESTONES OF THE GREENBRIER SERIES.

Alderson Limestone.

The Alderson Limestone, previously described on pages 324-7, is the upper member of the Greenbrier Series but is nearly always sandy and impure, and quite often shaly, although in some localities it hardens and becomes more pure. Its thickness usually varies from 40 to 60 feet and it generally contains alternating benches of varying characteristics, partly crystalline and partly sandy or shaly. In some localities it is entirely absent.

In Leadsville District the Aggregates Section, page 150, shows it as 40 feet thick, mostly dark and yellow, as poorly exposed above the Gates and Bailey Quarry. Here a sample (No. 652R) was collected, the composition of which is published under Exposure No. 5 in the Table of Limestone Analyses at the end of this Chapter. This analysis shows a rather pure limestone, with 91.60 per cent. of calcium carbonate, apparently well suited for the manufacture of Portland cement.

In Beverly District it is 55 feet thick at the Monongahela Construction Company Quarry at Faulkner, as will be later noted in a detailed section, being dark, sandy or shaly, and impure. In Dry Fork District it is prominent on the land of E. R. Dyer (Exposure No. 6 on Map II), on the east side of Shavers Mountain four miles southwest of Alpena, as detailed in the Collett Gap Section, page 191. Here it is 40 feet thick, and dark-gray, weathering white or yellow. A sample (No. 700R) was collected, the composition of which is published in the Table of Limestone Analyses at the end of this Chapter. The calcium carbonate content, 90.16 per cent., is very good. On the west side of Dry Fork 5½ miles above the junction with Gandy Creek, it is 55 feet thick on the land of Osceola Dyer, as will be later detailed under the discussion of Union Limestone on this farm. Numerous other exposures may be seen in the same valley.

Union Limestone.

The Union Limestone, previously described on pages 328-333, is usually composed of three portions in Randolph County, including the Gasper Portion at the top which is gray or dove-colored, usually pure and weathering white with a thickness of 40 to 60 feet; the Bethel Sandstone Portion at the middle, usually composed of sandstone and red shale with a little limestone, having a thickness of 10 to 20 feet and being waste material when found in a quarry; and the Fredonia Portion at the bottom, usually hard and somewhat siliceous, almost invariably cross-bedded, and having occasional thin beds of sandstone but often having benches of pure crystalline lime, its thickness being 50 to 75 feet.

At the larger limestone quarries of the county the Gasper and Fredonia portions are usually quarried at the same time, the Bethel Sandstone portion being discarded as waste. The Gasper portion is generally the more suitable for agricultural lime on account of its greater purity, while the Fredonia portion usually makes better ballast and aggregate on account of its silica which makes it harder and less susceptible to erosion.

In New Interest District the Union has been operated for agricultural lime at a few small quarries in Laurel Ridge. The Robert Johnson Quarry, located on the south side of Saltlick Run of Leading Creek, on the lower slope of Laurel Ridge, shows the following section:

Robert Johnson Limestone Quarry.

		Feet.
1.	Limestone, Union (Gasper portion), gray, pure, oolitic, visible	3
2.	Concealed and red shale, Bethel portion	25
3.	Limestone, shaly, probably Bethel	3
4.	Limestone, Union (Fredonia portion), gray, hard, oolitic, somewhat siliceous, quarry rock (2440' B.)	15

At this locality the Fredonia portion has been quarried through a face 60 feet long and into the hill 40 feet, its dip being northwestward at an angle of 26°. This stone has been mainly hauled away for agricultural lime.

At the Lewis Harris Quarries, on the north side of Schoolcraft Run of Leading Creek on the lower slope of Laurel Ridge 2.5 miles west of Montrose, the Union has been opened in three closely adjacent points, as follows:

Lewis Harris Limestone Quarry—Western Opening.

		Feet.
1.	Shale, red, visible	5
2.	Limestone, Union (Gasper portion), gray, thick-bedded, pure, amorphous, with cup corals, quarry rock (2390' B.)	15
3.	Concealed, dip northwest, 32°	

Lewis Harris Limestone Quarry, Central Opening—No. 25 on Map II.

(At crusher, northeast of above).

		Feet.
1.	Soil	
2.	Limestone, Union (Fredonia portion), gray, massive, oolitic, fairly pure, cross-bedded at top; quarry rock (2410′ B.)	20
3.	Concealed to Pocono outcrop, dip northwest, 30°	30

A sample (No. 656R) was collected from No. 2 of section, the composition of which is published under Exposure No. 25 on Map II in the Table of Limestone Analyses at the end of this Chapter. Here this lime was formerly burned but at present a crusher is intermittently operated by Canfield and Simmons for road material and agricultural lime.

Lewis Harris Limestone Quarry—Eastern Opening.

(Northeast of above, toward gap).

		Feet.
1.	Shale, red	
2.	Limestone, Union (Gasper portion), gray, pure, mostly amorphous, with a little oolite, quarry rock, (2480′ B.), visible	10

This latter place is not in operation but was formerly used for agricultural lime.

In Leadsville District the Union Limestone was operated for several years at the Gates & Bailey Quarry, at Aggregates, in the northern end of Rich Mountain south of Tygart River 3½ miles west of Elkins, but for the past few years the enterprise has been dormant. According to W. T. Gates, Manager, of Elkins, the capacity of the plant when in operation is 600 tons per 10-hour day, the output in the summer of 1926 being about 150 tons per day. Most of the product is crushed stone, mainly used for road metal, ballast, and concrete aggregate. At this time the equipment included a No. 6½ Gates crusher, a power-house containing two 250-K. W. units with two Keely boilers and two Ball engines, a Schramm air compressor, several Schramm air drills and also a churn drill outfit, a storage bin of 800 tons capacity, and sidings both on the Baltimore and Ohio (Coal & Coke) and Western Maryland Railroads.

At this locality the rock dips northwestward at an angle of about 15°, the base of the lime being just above river level at the southeastern end of the quarry but being almost entirely below drainage at the crusher and bridge. The rock is quarried by open cut, partly at a 300- or 400-foot face fronting eastward along the river where the latter has a north-south course, and partly in smaller pits farther west toward the crusher. Very little stripping has been done, as there is a considerable bench of stone with only slight cover. The strata are fully recorded in the Aggregates Section, pages 150-1. In this section all of the Union Limestone of the Greenbrier is quarried, there being some benches of hard lime in the Bethel portion as well as some beds of red shale and sandstone which must be rejected. Most of the stone quarried is hard and firm, not only in the Gasper and Fredonia portions but also in the Bethel, and well suited for the market it supplied.

As indicated in the section above mentioned, one sample (No. 651R) was collected from the upper 14 feet of the Gasper **(No. 7 on Map II)**; another (650R) from a two-foot bench of shaly magnesian lime in the Gasper **(No. 8 on Map II)**; another (No. 649R) from the lower 14 feet of the Gasper **(No. 9 on Map II)**; another (648R) from a six-foot bench of lime in the Bethel **(No. 24 on Map II)**; another (No. 647R) from the upper 35 feet of the Fredonia **(No. 26 on Map II)**; another (646R) from the middle 22 feet of the Fredonia **(No.** the Fredonia **(No. 28 on Map II)**. The compositions of these the Fredonia **(No. 28 on Map II)**. The composition of these samples, as published in the Table of Limestone Analyses at the end of this Chapter, together with samples of the unquarried Alderson and Glenray Limestones (Nos. 652R and 654R, respectively) which are higher in the mountain and which are published in the same table, and together with a sample (No. 653R) of the Lillydale Shale, published in the description of that formation, page 313, afford rather complete information and indicate that there is an abundance of good material for the manufacture of Portland cement, plans for which have at various times been contemplated at this site.

In **Beverly District** the Union Limestone has been quarried extensively at various points. At the **Grace Hart Johnson Quarry (Nos. 10 and 29 on Map II)** along the Staunton and Parkersburg Pike on the eastern slope of Rich Mountain 3.3 miles west of Beverly, as shown by the Beverly Section, page 156, the upper 30 feet of the Gasper portion was formerly burned for agricultural lime, while the middle, 10-foot, shaly part was let alone and the lower bench of 20 feet was used for road metal. A sample (No. 663R) was collected from the entire Gasper. At this locality the Fredonia portion consists of 25 feet of hard lime from which another sample

(No. 664R) was collected. The compositions of these two samples are published in the Table of Limestone Analyses at the end of this Chapter.

On the western side of Cheat Mountain facing Left Fork of Files Creek 0.8 mile southeast of Elkhorn School, a sample (No. 658R) was collected from a 75-foot bench of the Fredonia portion on the land of **Richard Wamsley (No. 30 on Map II)**, as detailed in the Elkhorn School Section, page 159. The composition of this sample, as published in the Table of Limestone Analyses at the end of this Chapter, shows a very good lime, with 93.80 per cent. of calcium carbonate.

On the land of **G. W. Daniels**, on the western slope of Cheat Mountain facing the waters of Right Fork of Files Creek one mile southeast of Millstone School, the following exposure of Union Limestone was noted:

G. W. Daniels Limestone Exposure—Nos. 11 and 31 on Map II.

		Feet.
1.	Concealed in thicket	
2.	Limestone, Union (Gasper portion), gray, weathering white, pure, oolitic	15
3.	Concealed, with limestone boulders	50
4.	Limestone, Union (Fredonia portion), dark-gray, somewhat sandy, oolitic, and cross-bedded (2790′ B.), visible	25

According to local report some limestone was once burned here for agricultural lime, but, if so, little indication now remains as to the portion used. One sample (No. 659R) was collected from the Gasper portion, No. 2 of section; and another (No. 660R) was collected from the visible Fredonia portion, No. 4 of section. The compositions of these two samples are published in the Table of Limestone Analyses at the end of this Chapter. The Fredonia is quite sandy but the Gasper shows 96.98 per cent. of calcium carbonate.

The **Monongahela Construction Company**, of Fairmont, W. Va., operates a limestone quarry at Faulkner on Shavers Fork of Cheat River, with shipping point at Nydegger Siding on the Durbin Branch of the Western Maryland Railway, the operation having been acquired in March, 1925, from the Nydegger Lime and Stone Company which opened the quarry in 1911 or 1912. When visited in 1926 this company had an output of 225 to 250 tons daily of crushed limestone for road metal, ballast and general construction purposes, employing 30 men of whom 7 were skilled laborers. The equipment includes an Ingersoll-Rand air compressor, a Champion No. 5C crusher (with the expectation that an Acme No. 9½C crusher would soon be installed), one 50-H. P. Gamble boiler, one 25-H. P. Geiser boiler with engine attached, one P. H. Nagel engine, two Jeffery pulverizers, one cylindrical steel upright kiln of 25 tons daily capacity (not in use), one house for air compressor and lime storage, one combined engine and crusher house, and a 500-foot railroad siding of 11-car capacity, as reported by J. D. Collett, Superintendent.

A section of the quarry and overlying strata exposed in the steep slope of Pond Lick Mountain, measured with hand-level and arranged in descending stratigraphic order, is as follows:

Monongahela Construction Company Limestone Quarry Exposure—Nos. 2, 3, 12, and 32 on Map II.

	Thickness. Feet.	Total. Feet.
Mauch Chunk Series—Bluefield Group (259′+)		
1. Shale, red, partly concealed	100	100
2. Concealed with a little sandstone and limestone	33	133
3. **Limestone, Glenray,** dark-gray, slightly oolitic; **Sample No. 673R** across face	49	182
4. **Limestone, Glenray,** dark, sandy, partly concealed (2483′ B.); **Sample No. 674R** from outcropping portions	55	237
5. Concealed, with shale, **Lillydale Shale** (2461′ B.)	22	259
Greenbrier Series (186′)		
6. **Limestone, Alderson,** dark, sandy or shaly, impure, partly concealed (2406′ B.)	55	314
7. **Sandstone, Cypress,** calcareous; and red shale (2394′ B.)	12	326
8. **Limestone, Union (Gasper** portion), light-gray, weathering white, oolitic, with marine fossil fragments and streaked with oily residue (2386′ B.); **quarry rock; Sample No. 675R** across face, 6′ to	8	334
9. Shale, red and green, partly calcareous and partly sandy, **Bethel Sandstone** portion of **Union Limestone** (2383′ B.), 2′ to	3	337
10. **Limestone, Union (Fredonia** portion), dark-gray, weathering white, mostly oolitic, with small crinoids; **quarry rock**	22	359
11. **Limestone, Union (Fredonia** portion), dark-gray, weathering white, amorphous, pure, with a few small crinoids; **quarry rock**	19	378
12. **Limestone, Union (Fredonia** portion), soft, shaly; **quarry rock**	1	379

	Thickness. Feet.	Total. Feet.
13. Limestone, Union (Fredonia portion), dove-colored, weathering white, pure; quarry rock	6	385
14. Limestone, Union (Fredonia portion), dark, amorphous, slightly siliceous; quarry rock	6	391
15. Limestone, Union (Fredonia portion), dark-gray, hard, oolitic, pure (2313′ B.); quarry rock	16	407
Sample No. 676R across face of Nos. 10-15, inclusive.		
16. Limestone, Union (Fredonia portion), not visible but reported under dump (2275′ B.)	38	445

The compositions of all samples, as above noted, are published in the Table of Limestone Analyses at the end of this Chapter. In chemical quality it is evident that the upper half of the Glenray Limestone is quite pure, with 94.96 per cent. of calcium carbonate; the lower half of the Glenray is sandy, with 72.73 per cent. of calcium carbonate; the Gasper portion of the Union is quite pure, with 96.21 per cent. of calcium carbonate; and the Fredonia portion of the Union is sandy, with 82.97 per cent. of calcium carbonate. These figures, naturally, do not indicate good or bad limestone for the road metal and construction purposes for which the product of this quarry is now mostly used but they are of value in the consideration of any potential chemical use to which it might be put. For road metal and construction, however, it is rather well known that a slightly siliceous lime, such as the Fredonia portion of the Union, is more durable than a higher calcium lime like the Gasper portion, provided the original physical hardness is the same. The Glenray and Gasper at this locality appear to be rather well suited for the manufacture of Portland cement, but the Fredonia has too much silica and magnesium to make it desirable for such a purpose, unless equalized by mixture with high calcium and low magnesium lime.

The **Elkins City Lime Quarry**, located in the hill south of Shavers Fork and just southeast of Bowden Station, which was opened as a municipal enterprise to supply the paving and construction needs of the city, has been abandoned for several years, the location having proved to be poor on account of the quality of the lime, much of which had been weathered out and replaced by river clay, sand, and boulders when Shavers Fork ran at a higher level. The equipment included a revolving crusher run by a gas engine, and a loading rack and railroad siding. A section, measured with aneroid

PLATE LIX.—Close view of flattened tree trunks in Elkins Sandstone of Chemung. The largest trunk, between the two sample bags, measures 10 feet 6 inches by 16 inches. Just above it is another measuring about 6 feet, and to the right a third is partly visible. Fossil Lot 396, 2.6 miles northwest of Elkins. (Photo. by E. E. Harris.)

PLATE LX.—Close view of tree trunks in Elkins Sandstone of Chemung at Fossil Lot 396, along Tygart River 2.6 miles northwest of Elkins. The two-foot rule gives an idea of size. (Photo. by E. E. Harris.)

PLATE LXI.—Elkins Sandstone of Chemung at Fossil Lot 388 in cut of Valley River Railroad east of Tygart River and one-third mile north of Spangler, showing an imbedded zone of tree trunks. (Photo. by E. E. Harris.)

PLATE LXII.—Elkins Sandstone of Chemung at Fossil Lot 388 in cut of Valley River Railroad east of Tygart River and one-third mile north of Spangler, showing one longitudinal view and several cross-sections of tree trunks. The cross-section at right measures 26 by 16½ inches. (Photo. by E. E. Harris.)

and arranged in descending stratigraphic order, shows the following:

Elkins City Limestone Quarry Exposure.

	Thickness. Feet.	Total. Feet.
Greenbrier Series (55'+)		
1. Shale, red and yellow	10	10
2. Limestone, Union (Fredonia portion), dove-colored, fairly pure but much water-worn, with fragments of crinoids and brachiopods; quarry rock	15	25
3. Limestone, Union (Fredonia portion), blue, hard, amorphous, poorly exposed; quarry rock	15	40
4. Limestone, Union (Fredonia portion), dark-gray, siliceous, oolitic, poorly exposed in quarry but visible in field to westward (2245' B.); quarry rock	15	55
Maccrady Series (12')		
5. Limestone, Warsaw?, yellow, oolitic and siliceous, with small quartz pebbles	7	62
6. Shale and sandstone, all yellow and calcareous (2233' B.)	5	67
Pocono Series (8'+)		
7. Sandstone, thick-bedded, with gray shale, to railroad track (2225' B.)	8	75

No samples were taken at this quarry.

For many years the **Standard Lime and Stone Company**, of Baltimore, Maryland, operated a quarry on the south side of Shavers Fork along the Western Maryland Railway 0.2 mile east of Bowden, but when examined in 1926 it had been abandoned for several years, and all the equipment had been removed. According to local report this stone was mainly used for railroad ballast, the face of the old quarry being 200 feet long and extending 150 feet into the hill. A section, measured with aneroid and arranged in descending stratigraphic order, shows the following:

Standard Lime and Stone Company Limestone Quarry Exposure—Nos. 33, 34, and 35 on Map II.

	Thickness. Feet.	Total. Feet.
1. Shale, red, (part of Bethel Sandstone), in top of bluff, visible	10	10
2. Limestone, (part of Bethel stage), gray, hard, very siliceous; quarry rock	15	25
3. Sandstone, Bethel, red, calcareous, with red shale and a few brachiopods (2285' B.); quarry rock	5	30

	Thickness. Feet.	Total. Feet.
4. **Limestone, Union (Fredonia** portion) light-gray, hard, oolitic, pure, with crinoids and brachiopods; **quarry rock; Sample No. 678R** across face	15	45
5. **Limestone, Union (Fredonia** portion), dove-colored, hard, fairly pure; **quarry rock; Sample No. 679R** across face	20	65
6. **Limestone, Union (Fredonia** portion), gray, slightly siliceous, oolitic, hard; **quarry rock**; extends to base of quarry and railroad track (2230′ B.); **Sample No. 680R** across face	20	85
7. Concealed, with yellow **Warsaw Limestone,** to big spring below railroad track	10	95

Of these three samples, No. 678R shows 91.36 per cent. of calcium carbonate; No. 679R shows 81.69 per cent.; and No. 680R shows 86.81 per cent., all being published in detail in the Table of Limestone Analyses at the end of this Chapter.

The **Leadsville District Quarries**, located on the southeast side of Shavers Fork along the Western Maryland Railway 0.4 mile east of Bowden, and operated for several years to supply metal for the roads of Leadsville District, were abandoned some years prior to the visit of the writer in 1926. Little equipment, except an old revolving crusher, remained on the ground. At this locality there were three closely adjacent quarries, using different levels of the stone, the highest of the three being farther to the southeast. The combined exposures of these quarries, measured with aneroid and arranged in descending stratigraphic order, show the following:

Leadsville District Limestone Quarries Exposure—No. 14 on Map II.

	Thickness. Feet.	Total. Feet.
1. **Limestone, Union (Gasper** portion), gray, weathering white, oolitic, pure, with a few crinoids and brachiopods (2335′ B.); **upper quarry rock; Sample No. 631R** across face	40	40
2. Concealed	10	50
3. **Limestone, Union (Gasper** portion), gray; **middle quarry rock**	10	60
4. Shale, red and calcareous, alternating with red sandstone (part of **Gasper**); in **middle quarry**	10	70
5. **Limestone, Union (Gasper** portion), dove-colored, oolitic, pure; **middle quarry rock**	15	85

	Thickness. Feet.	Total. Feet.
6. Limestone, Union (Gasper portion), shaly, impure; middle quarry rock (also visible in top of lower quarry) (2285′ B.) ------	5	90
7. Shale, red, calcareous ------- 10′		
8. Limestone, drab, hard ---------- 10		
9. Limestone, light-gray, oolitic, pure, to base of lower quarry (2250′ B.) ------------ 15		
10. Sandstone, red, calcareous, and shaly (not quarried) ----- 5		
(7–10) Union Limestone (Bethel Sandstone portion) ---------	40	130
11. Limestone, Union (Fredonia portion), gray, oolitic, pure, to railroad grade (2230′ B.)	15	145

The composition of the sample (No. 681R) from No. 1 of section is published in the Table of Limestone Analyses at the end of this Chapter, the calcium carbonate being only 83.15 per cent.

The stratigraphic relationship of these two quarries is easily recognizable on the ground, No. 10 of the Leadsville District Quarries being the same as No. 3 of the Standard, and No. 11 of Leadsville the same as No. 4 of the Standard.

In **Huttonsville District** the Union Limestone occurs both in the eastern slope of Rich Mountain west of Tygart Valley and in the western slope of Cheat Mountain, as shown by various sections in Chapter V and as further discussed in Chapter VII, but no commercial quarries have been operated and little local use has been made of the stone. On the southeastern side of Mill Creek, three miles southwest of Mill Creek town, a sample (No. 662R) was collected from 40 feet of the Fredonia portion of the Union, outcropping at elevation 2260′ B., on the land of **John F. Nydegger (Exposure No. 36 on Map II)**. Here this portion of the stone is hard, somewhat siliceous, cross-bedded, slightly oolitic, and contains a few crinoids. The composition of this sample, which shows 84.12 per cent. of calcium carbonate, is published in the Table of Limestone Analyses at the end of this Chapter.

In **Mingo District** the Union Limestone outcrops over a vast territory in Cheat Mountain and Rich Mountain, encircles the head of Tygart Valley, and comes above drainage again on Elk River. In the Cheat Mountain country, as recorded in the Snyder Knob Section, page 175, a sample (No. 682R) was collected across the face of the Gasper portion, 80 feet thick, on the land of **Woodford Hutton (Exposure No. 15 on Map II)** on Conley Run of Tygart River three miles east of Valley Head. The composition of this sample, showing 95.28 per cent. of calcium carbonate, is published in the Table of Limestone Analyses at the end of this Chapter.

At the head of Tygart Valley, the Union Limestone is now very well exposed in the new highway cuts of the Seneca Trail, as recorded in the Mingo Section, page 177. Here a sample (No. 687R) was collected from the Fredonia portion, 25 feet thick, on the land of **F. P. Marshall Heirs (Exposure No. 37 on Map II)**, on the State road 0.7 mile northwest of Mace, the composition of which is published in the Table of Limestone Analyses at the end of this Chapter. This ledge showed 89.74 per cent. of calcium carbonate, with 3.58 per cent. of magnesium carbonate.

West of Tygart Valley the following exposure of Union Limestone and closely associated rocks was measured with aneroid and arranged in descending stratigraphic order on the land of **G. N. Wilson** on the south side of Stony Run of Elkwater Fork 0.7 mile from the mouth of the run and 2.4 miles north of Monterville, starting at the cemetery 1.7 miles north of Monterville and descending the mountain road to the point mentioned:

G. N. Wilson Limestone Exposure—No. 13 on Map II.

	Thickness. Feet.	Total. Feet.
Mauch Chunk Series—Bluefield Group (470'+)		
1. Shale, red, partly concealed	35	35
2 **Sandstone, Bradshaw**, red, flaggy; makes shoulder (3100' B.)	25	60
3. Shale, red, partly concealed (2690' B.)	410	470
Greenbrier Series (90')		
4. **Limestone, Union (Gasper portion)**, gray, weathering white, pure, partly oolitic (2665' B.); **Sample No. 670R** across face	25	495
5. Shale, red, partly concealed, **Bethel Sandstone portion**	15	510
6. **Limestone, Union (Fredonia portion)**, dark-gray or dove-colored, partly pure and partly siliceous and cross-bedded, with streaks of oolite (2600' B.)	50	560
Pocono Series (100'+)		
7. **Sandstone, Broad Ford**, greenish-gray, thick-bedded, with shaly streaks and with a 20-foot ledge having flat quartz pebbles, estimated thickness	100	660

The Gasper portion, No. 4 of the above section, has been quarried by **Chas. W. Louk** to burn agricultural lime for use on the Wilson farm. The composition of the sample (No. 670R) is published in the Table of Limestone Analyses at the end of this Chapter, showing 90.35 per cent. of calcium carbonate. The portion of the section above the limestone is measured practically on the strike of the rocks and represents true vertical measurement, but at the base the thickness of the limestones is less than true vertical measurement would show, because of the northwestward dip which is several degrees.

In the big sink just southeast of Monterville and northeast of the new State road, the following measurement of the Greenbrier Series was made with aneroid and arranged in descending stratigraphic order on the land of Geo. W. Fretwell, due correction being made for the northwestward dip of the rocks:

Geo. W. Fretwell Limestone Exposure—Nos. 16, 38, and 44 on Map II.

	Thickness. Feet.	Total. Feet.
Greenbrier Series (255')		
1. Limestone, Alderson, exposed partly in road	40	40
2. Limestone, Union (Gasper portion), gray weathering white, partly oolitic (2790' B.); Sample No. 685R across face	55	95
3. Limestone, Union (Bethel portion), impure, partly concealed	10	105
4. Limestone, Union (Fredonia portion), gray, pure, partly oolitic, with crinoids and cup corals (2925' B.); Sample 684R across face	40	145
5. Limestone, Pickaway, dark, impure, sandy, and partly stylolitic (2910' B.)	20	165
6. Limestone, Patton, dark-gray, slightly siliceous, with oolite (2855' B.); Sample No. 683R across face	65	230
7. Sandstone, Patton Shale horizon, greenish-brown, flaggy	5	235
8. Limestone, Sinks Grove, siliceous at top, pure and oolitic at base (2850' B.)	20	255
Pocono Series (----)		
9. Sandstone, Broad Ford, in sink		

The compositions of the above samples are published in the Table of Limestone Analyses at the end of this Chapter. All show very good analyses, the Gasper having 92.58 per cent. of calcium carbonate, the Fredonia 96.41 per cent., and the Patton 89.82 per cent., with no great amount of magnesium in any of the samples. The Gasper and Fredonia would be well adapted to the manufacture of Portland cement.

On Elk River the Gasper portion of the Union is exposed for several miles from the Pocahontas County line northwestward into Randolph County but goes under drainage a mile or so above Valley Fork. The following exposure is visible on the land of the **West Virginia Pulp & Paper Company** on the south side of Elk 1.3 miles south of the mouth of Valley Fork and 2.6 miles southwest of Blue Spring:

West Virginia Pulp & Paper Company Limestone Exposure —No. 17 on Map II.

	Thickness. Feet.	Total. Feet.
1. **Limestone, Alderson**, dark, somewhat sandy and impure (2360' B.)	60	60
2. **Limestone, Union (Gasper portion)**, gray, weathering white, oolitic, visible above railroad track (2340' B.)	20	80
3. Concealed in railroad fill, **(Gasper)**	10	90
4. **Limestone, Union (Gasper portion)**, gray, weathering white, oolitic, to dry bed of Elk River (2310' B.)	20	110

A sample (No. 694R) was collected from Nos. 2 and 4 of section, the composition of which is published in the Table of Limestone Analyses at the end of this Chapter. This sample shows only 88.41 per cent. of calçium carbonate and 3.96 per cent. of magnesium carbonate. No. 4 of section, however, has been subject to extensive leaching in the bed of the river and has probably lost part of its calcium carbonate.

In **Dry Fork District** the Union Limestone makes a long outcrop in the western side of McGowan Mountain from the Tucker County line southward to the turn of Shavers Fork and thence eastward to Bowden. No samples were taken on this outcrop but the nature of the limestone is indicated in the Bickle Knob Section, page 188, and its chemical quality is well exhibited by analyses from quarries in Beverly District on the opposite side of the river.

Another long outcrop of Union Limestone occurs on the eastern slope of Shavers Mountain west of Glady Fork, being exhibited in the Evenwood Section, page 192, and the Collett Gap Section, page 191. At the latter locality, four miles south of Alpena, two samples of the Union were collected on the land of **E. R. Dyer (Exposures Nos. 18 and 39 on Map II)**, one of which (No. 699R) is from 27 feet of the Gasper and the other of which (No. 698R) is from 108 feet of the Fredonia. The compositions of these samples are published in the Table of Limestone Analyses at the end of this Chapter. The Gasper shows 91.41 per cent. of calcium carbonate and 4.19 per cent. of magnesium carbonate, while for the Fredonia the same respective figures are 88.55 and 1.66. At the same locality the Alderson Limestone, which outcrops above them, shows (in Sample No. 700R) 90.16 per cent. of calcium carbonate and 1.95 per cent. of magnesium carbonate. A weighted average of the three should make material suitable for the manufacture of Portland cement but would, of course, require mixture with shale, as is the case with nearly all Greenbrier outcrops.

On the land of the **Globe Realty Company (Exposure No. 23 on Map II)**, in Shavers Mountain just northwest of Glady Station the Gasper portion of the Union is visible at elevation 2945′ B., coming 30 feet above the Western Maryland Railway track, with a thickness of 70 feet. Here the stone is gray, weathering white, oolitic and very pure. A sample (No. 720R), as published in the Table of Limestone Analyses at the end of this Chapter, shows 95.09 per cent. of calcium carbonate and only 1.31 per cent. of magnesium carbonate. From Glady southward to the Greenbrier County line at the head of West Fork of Glady, there is a five-mile outcrop of the Gasper and other portions of the Greenbrier, coming at convenient height above the tracks of the Western Maryland Railway and offering great opportunity for exploitation.

East of Laurel Fork there is a long outcrop of Union on the western slope of Rich Mountain, as previously noted, on the land of **William Adamson**, page 333, where the entire Greenbrier is exposed. The following exposure was observed on the land of **Charles Judy** east of Laurel Fork 0.5 mile south of the Elkins-Franklin road and 2.1 miles northwest of Job:

Charles Judy Limestone Exposure—No. 40 on Map II.

				Feet.
1.	Limestone, red, sandy	10′	Bethel portion of Union Limestone	20
2.	Concealed	10		
3.	Limestone, Union (Fredonia portion), gray, oolitic, pure, makes reef in topography (3140′ B.)			70
4.	Sandstone, red, calcareous (dip 20° eastward)			5

A sample (No. 708R) was collected across the face of No. 3 of section, the composition of which is published in the Table of Limestone Analyses at the end of this Chapter. Here the calcium carbonate is 90.66 per cent.

In the valley of Dry Fork the following exposure was measured by aneroid on the land of **Daniel Cooper Heirs** on the west side of Dry Fork 0.4 mile south of Harman:

Daniel Cooper Heirs Limestone Exposure—Nos. 19 and 41 on Map II.

			Thickness. Feet.	Total. Feet.
1.	Limestone, Union (Gasper portion), gray, weathering white, oolitic, pure (2480′ B.); Sample No. 705R across outcrop		50	50
2.	Concealed		20	70
3.	Sandstone, Bethel portion of Union Limestone, red, calcareous		10	80
4.	Limestone, gray, fairly pure, slightly oolitic	30′		
5.	Sandstone, red, calcareous	5		
6.	Limestone, gray, slightly oolitic	25	Union Limestone (Fredonia portion) (2375′ B.) 75	155
7.	Concealed and dark limestone to road	15		

Sample No. 706R from Nos. 4 and 6.

The compositions of these two samples (Nos. 705R and 706R) are published in the Table of Limestone Analyses at the end of this Chapter. The Gasper shows 90.86 per cent. of calcium carbonate and the Fredonia 91.48 per cent. The base of this exposure is practically at the base of the Greenbrier Series.

Northward from this point toward Red Creek, there are many good exposures of Union Limestone on both sides of Dry Fork. To the southward it goes under drainage between Hazelwood and Job but briefly reappears 5½ miles above the mouth of Gandy Creek where the following exposure was noted on the west side of Dry Fork on the land of **Osceola Dyer** just northwest of a private road fork and 5.4 miles southwest of Horton:

Osceola Dyer Limestone Exposure—No. 20 on Map II.

		Thickness. Feet.	Total. Feet.
Mauch Chunk Series—Bluefield Group (85′+)			
1.	Sandstone, Webster Springs, greenish-brown, flaggy	5	5
2.	Concealed	35	40
3.	Limestone, Glenray, gray, hard, weathering somewhat yellow, with abundant crinoids and with cup corals (3375′ B.); Sample No. 712R across face	25	65
4.	Shale, Lillydale, red, calcerous, partly concealed, with crinoids (3355′ B.)	20	85

	Thickness. Feet.	Total. Feet.
Greenbrier Series (80'+)		
5. **Limestone, Alderson,** dark, weathering yellow, hard, impure, with gastropods (3300' B.)	55	140
6. **Limestone, Union (Gasper portion),** gray, pure, slightly oolitic; to river bottom (3275' B.); **Sample No. 713R** across face ------	25	165

The compositions of these two samples (Nos. 712R and 713R) are published in the Table of Limestone Analyses at the end of this Chapter. The Glenray is fairly high in silica, with only 84.22 per cent. of calcium carbonate, but the Gasper shows 95.16 per cent. of calcium carbonate.

On Gandy Creek the Whitmer Section, page 211, records the Union Limestone as exposed on the land of **Ed. Lukens (Exposures Nos. 21 and 42 on Map II),** 1.2 miles northeast of Whitmer on the northern branch of a tributary which enters Gandy 0.6 mile below Whitmer. Here a sample (No. 714R) was collected across the total 85-foot face of the Gasper and another (No. 715R) was collected from 80 feet, or the lower two-thirds, of the Fredonia, as published in the Table of Limestone Analyses at the end of this Chapter. Both are very good, the Gasper having 90.81 per cent. of calcium carbonate and the Fredonia 96.37 per cent.

South of the tributary above mentioned the Union disappears above the topography of Allegheny Mountain but on the west side of Gandy Creek is found in the eastern slope of Little Middle Mountain from the mouth of Gandy to the Pocahontas County line, approximately 12 miles. It is well exhibited on the south slope of Yokum Knob one-half mile northwest of Osceola, as recorded in the Osceola Section, page 212. Here a sample (No. 717R) was collected from the visible 110 feet of Gasper, and another (No. 716R) from the total 100 feet of Fredonia, both on the land of **Bruce Yokum (Exposures Nos. 22 and 43 on Map II),** as published in the Table of Limestone Analyses at the end of this Chapter. Here the Gasper shows only 86.48 per cent. of calcium carbonate and 5.38 per cent. of magnesium carbonate, but the same respective figures for the Fredonia are 93.34 per cent. and 1.30 per cent.

It is evident from the above description of the Union Limestone that it could furnish an inexhaustible supply of good material for the manufacture of Portland cement in Randolph County, as well as construction material; and it is also evident that it could supply any amount of agricultural lime needed in the county with a surplus for outside shipment.

Pickaway Limestone.

The **Pickaway Limestone**, previously discussed on pages 333-4, principally occurs in Mingo District where it varies from 10 to 75 feet in thickness and where it is dark, sandy, and impure. It may furnish some material for construction purposes but does not appear to be suited for agricultural lime, Portland cement, or any of the uses where a pure limestone is required. No samples were taken for analysis.

Taggard Limestone.

The **Taggard Limestone**, previously discussed on page 334, occurs only in Mingo District where it is thin, impure, and apparently not suited for industrial use.

Patton Limestone.

The **Patton Limestone**, previously discussed on pages 334-5, occurs mainly in Mingo District and at one or two isolated exposures in Dry Fork District. In the Valley Head Section, page 173, it is noted as dark-gray, slightly siliceous, and 65 feet thick, as exposed on the State road southeast of Monterville.

In the **George W. Fretwell Limestone Exposure (No. 44 on Map II)**, as detailed on page 693, it is recorded in the big sink just southeast of Monterville, as dark-gray and slightly siliceous, with a thickness of 65 feet. A sample (No. 683R) was collected at this exposure, the composition of which is published in the Table of Limestone Analyses at the end of this Chapter. Here its calcium carbonate content is 89.82 per cent. and its magnesium carbonate 2.02 per cent.

In the Mingo Section, page 178, it is recorded as 63 feet thick, mostly dark-gray but tinged with red, partly oolitic but mostly sandy and hard. A sample (No. 688R) collected on the land of **F. P. Marshall Heirs (Exposure No. 45 on Map II)**, on the new State road 0.6 mile northwest of Mace at elevation 3172′ B., is published in the Table of Limestone Analyses at the end of this Chapter. This analysis shows 93.12 per cent. of calcium carbonate and 2.18 per cent. of magnesium carbonate, indicating a quality similar to the Fredonia portion of the Union.

In **Dry Fork District** it was noted at the Evenwood Section, pages 192-3, where it is 15 feet thick, partly dove-colored and partly yellow and sandy. In the regions of its occurrence it is firm and durable, indicating a stone that would be good for road metal or other construction purposes; and its chemical quality is such that it would probably blend acceptably with the Gasper and Fredonia portions of the Union to make Portland cement.

Sinks Grove Limestone.

The **Sinks Grove Limestone,** previously discussed on page 335, is found only in Mingo District, where it is dark or yellow, hard, amorphous, and somewhat sandy, with a thickness of 20 to 70 feet. In the Valley Head Section, page 173, it is recorded as 20 feet thick, mostly dark and siliceous, and in the **George W. Fretwell Limestone Exposure,** page 693, it has the same thickness and approximately the same character.

In the Mingo Section, page 178, it is noted as 70 feet thick, gray, hard, and oolitic at the top, but becoming impure and sandy farther down. A sample (No. 689R) was collected from the upper 20 feet on the land of **F. P. Marshall Heirs (Exposure No. 46 on Map II),** along the new State road south of an old church and 0.7 mile northwest of Mace, as published in the Table of Limestone Analyses at the end of this Chapter. This sample shows 91.51 per cent. of calcium carbonate and 0.32 per cent. of magnesium carbonate. This stone would make agricultural lime or Portland cement and it is hard enough for construction purposes. The lower portion would not be so good.

LIMESTONES OF THE MACCRADY SERIES.

Warsaw Limestone.

The **Warsaw Limestone,** previously discussed on pages 339-40, is yellow, impure, and siliceous, without the chemical and physical qualities to make it desirable for any known industrial use, and it seldom exceeds 10 feet in thickness, being known to occur only at a few localities in the southern part of the county. No samples were taken for analysis.

LIMESTONES OF THE DEVONIAN PERIOD.

LIMESTONES OF THE GENESEE SERIES.

Landes Limestone.

The **Landes Limestone,** previously discussed on page 395, is a dark and carbonaceous or bituminous bed with a thickness of only about two feet, and outcropping only in the valley of Leading Creek where it comes above drainage at the summit of the Deer Park Anticline. In New Interest District it was once burned for agricultural lime on the land of **Frank Vanscoy** on the south side of Stonespring Run 1.2 miles northwest of Kerens. In Leadsville District its occurrence on the land of **Philip Ware (Exposure No. 47 on Map II)**, on Horse Run 0.8 mile northwest of Whyte Station, has already been detailed, page 395. Here it is dark, hard, and two feet thick. A sample (No. 666R) was collected across the outcrop, the composition of which is published in the Table of Limestone Analyses at the end of this Chapter. This sample shows 79.33 per cent. of calcium carbonate and 15.30 per cent. of silica, indicating a stone of no special economic importance.

TABLE OF LIMESTONE ANALYSES.

The following table gives in compact form the results of chemical tests made on the limestones of Randolph County, the samples having been taken in the field by the writer and the analyses having been made by B. B. Kaplan and Harry J. Sigwart in the laboratory of the Survey. Following the table are brief references to the formations and portions of the same sampled, property ownership, location of outcrop or quarry, and page of text where described in full, the reference numbers being the same as those in the second column of the table, and as engraved on Map II:

Table of Limestone Analyses, Randolph County.

Sample No.	Reference No.	Name of Limestone	Silica (SiO_2)	Ferric Iron (Fe_2O_3)	Alumina (Al_2O_3)	Calcium Carbonate ($CaCO_3$)	Magnesium Carbonate ($MgCO_3$)	Potash (K_2O)	Soda (Na_2O)	Phosphoric Acid (P_2O_5)	Loss on Ignition	Total
		Mauch Chunk Series:										
654R	1	Glenray	15.00	2.40	6.40	70.65	2.66	....	....	....	2.50	99.61
673R	2	Glenray	2.90	0.32	0.88	94.96	0.99	....	....	....	0.10	100.15
674R	3	Glenray	17.60	0.80	7.06	72.73	2.07	....	....	Trace	0.09	100.35
712R	4	Glenray	10.62	2.92(a)	...	84.22	2.40	....	....	....	...	100.16
		Average, Glenray	11.43	?	4.78	80.64	2.03	....	....	....	0.897	100.07
		Greenbrier Series:										
652R	5	Alderson	4.70	0.40	2.50	91.60	0.28	....	....	Trace	0.35	99.83
700R	6	Alderson	6.25	1.97(a)	....	90.16	1.95	....	....	....	....	100.33
		Average, Alderson	5.475	?	... ...	90.88	1.115	....	....	....	....	100.08
651R	7	Union (Gasper portion)	12.80	1.60	8.20	75.66	1.62	....	....	....	0.49	100.37
650R	8	Union (Gasper portion)	14.00	1.82	3.80	49.00	30.60	....	....	....	0.60	99.82
649R	9	Union (Gasper portion)	13.30	0.80	6.40	73.88	2.25	....	....	Trace	3.05	99.68
663R	10	Union (Gasper portion)	20.20	1.01(a)	....	75.35	2.50	....	....	....	....	99.06
659R	11	Union (Gasper portion)	1.41	0.30(a)	....	96.98	0.99	....	....	....	....	99.68
675R	12	Union (Gasper portion)	2.02	0.37(a)	....	96.21	0.87	....	....	....	....	99.47
670R	13	Union (Gasper portion)	6 12	1.10(a)	....	90.35	2.08	....	....	....	....	99.65
681R	14	Union (Gasper portion)	13.59	1.24(a)	....	83.15	1.80	....	....	....	....	99.78
682R	15	Union (Gasper portion)	1.93	0.40(a)	....	95.28	1.70	....	....	....	....	99.31
685R	16	Union (Gasper portion)	3.28	1.52(a)	....	92.58	1.05	....	....	Trace	0.97	99.40
694R	17	Union (Gasper portion)	4.78	2.54(a)	....	88.41	3.96	....	....	....	....	99.69
699R	18	Union (Gasper portion)	3.41	1.34(a)	....	91.41	4.19	....	....	....	....	100.35
705R	19	Union (Gasper portion)	6.86	1.07(a)	....	90.86	1.48	....	....	....	....	100.27
713R	20	Union (Gasper portion)	2.56	0.58(a)	....	95.16	1.64	....	....	....	....	99.94
714R	21	Union (Gasper portion)	6.60	0.92(a)	....	90.81	1.55	....	....	....	....	99.88
717R	22	Union (Gasper portion)	6.82	0.82(a)	....	86.48	5.38	....	....	....	....	99.50
720R	23	Union (Gasper portion)	2.48	1.28(a)	....	95.09	1.31	....	....	....	....	100.16
		Average, Union (Gasper portion)	7.186	?	?	86.274	3.822	....	....	Trace	.602	99.77

Table of Limestone Analyses, Randolph County, (Concluded).

Sample No.	Reference No.	Name of Limestone.	Silica (SiO_2)	Ferric Iron (Fe_2O_3)	Alumina (Al_2O_3)	Calcium Carbonate ($CaCO_3$)	Magnesium Carbonate ($MgCO_3$)	Potash (K_2O)	Soda (Na_2O)	Phosphoric Acid (P_2O_5)	Loss on Ignition	Total
618R	24	Union (Bethel portion)....	40.60	0.46	2.00	56.22	0.48	....	....	Trace	0.50	100.26
656R	25	Union (Fredonia portion)..	7.82	0.47(a)	....	87.93	2.98	....	....	....	....	99.20
647R	26	Union (Fredonia portion)..	8.92	0.40	0.90	87.34	1.62	0.10(b)	....	Trace	0.60	99.88
646R	27	Union (Fredonia portion)..	12.60	0.80	4.60	76.74	1.80	0.06(b)	....	Trace	3.20	99.80
615R	28	Union (Fredonia portion)..	8.50	0.40	2.40	85.54	1.90	0.03	0.05	Trace	1.20	100.02
664R	29	Union (Fredonia portion)..	5.88	0.68(a)	....	88.38	4.62	....	....	....	....	99.56
658R	30	Union (Fredonia portion)..	3.88	0.70(a)	....	93.80	1.37	....	....	....	....	99.75
660R	31	Union (Fredonia portion)..	22.33	1.58(a)	....	75.76	0.82	....	....	....	....	100.49
676R	32	Union (Fredonia portion)..	12.01	1.17(a)	....	82.97	3.94	....	....	....	....	100.09
678R	33	Union (Fredonia portion)..	5.62	0.66(a)	....	91.36	2.07	....	....	....	....	99.71
679R	34	Union (Fredonia portion)..	13.04	1.73(a)	....	81.69	2.18	....	....	....	....	98.61
680R	35	Union (Fredonia portion)..	8.93	1.02(a)	....	86.81	3.32	....	....	....	....	100.08
662R	36	Union (Fredonia portion)..	12.96	1.14(a)	....	84.12	1.30	....	....	....	....	99.52
687R	37	Union (Fredonia portion)..	4.93	1.29(a)	....	89.74	3.58	....	....	....	....	99.54
684R	38	Union (Fredonia portion)..	1.48	0.25(a)	....	96.41	1.36	....	....	....	....	99.50
698R	39	Union (Fredonia portion)..	8.72	.93(a)	....	88.55	1.66	....	....	....	....	99.86
708R	40	Union (Fredonia portion)..	6.34	.81(a)	....	90.66	1.96	....	....	....	....	99.77
706R	41	Union (Fredonia portion)..	6.52	1.01(a)	....	91.48	0.94	....	....	....	....	99.95
715R	42	Union (Fredonia portion)..	1.85	0.26(a)	....	96.37	1.11	....	....	....	....	99.59
716R	43	Union (Fredonia portion)..	4.53	0.72(a)	....	93.34	1.30	....	....	....	....	99.89
		Average, Union (Fredonia portion)..	8.31	?	?	87.84	2.04	?	?	Trace	?	99.73
683R	44	Patton	6.45	.99(a)	....	89.82	2.02	....	....	....	....	99.28
688R	45	Patton	2.99	1.50(a)	....	93.12	2.18	....	....	....	....	99.79
		Average, Patton	4.72	1.25(a)	....	91.47	2.10	....	....	....	....	99.54
689R	46	Sinks Grove	6.62	0.19	0.61	91.51	0.32	....	....	....	0.51	99.76
		Genesee Series:										
666R	47	Landes	15.30	2.52(a)	....	79.33	1.65	....	....	....	....	98.80

(a) Alumina is included with the Ferric Iron.
(b) Soda is included with the Potash.

Page References to Detailed Descriptions and Sections of Limestones Listed in Preceding Table.

1. Glenray member of Mauch Chunk; Gates and Bailey land, at Aggregates; see p. 681.
2. Glenray member of Mauch Chunk (upper half); Monongahela Construction Co. land, 0.4 mile southeast of Faulkner; see pp. 681 and 687.
3. Glenray member of Mauch Chunk (lower half); Monongahela Construction Co. land, 0.4 mile southeast of Faulkner; see pp. 681 and 687.
4. Glenray member of Mauch Chunk; Osceola Dyer, 5.4 miles southwest of Horton; see p. 681.
5. Alderson member of Greenbrier; Gates & Bailey land, at Aggregates; see p. 682.
6. Alderson member of Greenbrier; E. R. Dyer, 3.8 miles southwest of Alpena; see p. 682.
7. Union member (Gasper portion) of Greenbrier (upper 14′); Gates & Bailey quarry at Aggregates; see p. 685.
8. Union member (Gasper portion) of Greenbrier (middle 2′); Gates & Bailey quarry at Aggregates; see p. 685.
9. Union member (Gasper portion) of Greenbrier (lower 14′); Gates & Bailey quarry at Aggregates; see p. 685.
10. Union member (Gasper portion) of Greenbrier; Grace Hart Johnson property, 3.2 miles northwest of Beverly; see p. 685.
11. Union member (Gasper portion) of Greenbrier; G. W. Daniels property, Cheat Mountain, 1 mile southeast of Millstone School; see p. 686.
12. Union member (Gasper portion) of Greenbrier; Monongahela Construction Co. quarry 0.4 mile southeast of Faulkner; see p. 687.
13. Union member (Gasper portion) of Greenbrier; G. N. Wilson property, 2.4 miles north of Monterville; see pp. 692-3.
14. Union member (Gasper portion) of Greenbrier (upper 40′); Leadsville District quarry, 0.3 mile east of Bowden; see pp. 690-1.
15. Union member (Gasper portion) of Greenbrier; Woodford Hutton property, 3 miles east of Valley Head; see pp. 691-2.
16. Union member (Gasper portion), of Greenbrier; Geo. W. Fretwell property, 0.3 mile south of Monterville; see p. 693.
17. Union member (Gasper portion) of Greenbrier; W. Va. Pulp & Paper Co. property, 2.6 miles southwest of Blue Spring; see p. 694.
18. Union member (Gasper portion) of Greenbrier; E. R. Dyer property, 3.8 miles southwest of Alpena; see pp. 694-5.
19. Union member (Gasper portion) of Greenbrier; Daniel Cooper Heirs property, 0.5 mile south of Harman; see pp. 695-6.
20. Union member (Gasper portion) of Greenbrier; Osceola Dyer property, 5.4 miles southwest of Horton; see pp. 696-7.
21. Union member (Gasper portion) of Greenbrier; Ed. Lukens property, 1.3 miles northeast of Whitmer; see p. 697.
22. Union member (Gasper portion) of Greenbrier; Bruce Yokum property, Yokum Knob, near Osceola; see p. 697.
23. Union member (Gasper portion) of Greenbrier; Globe Realty Co. property, just northwest of Glady Station; see p. 695.
24. Union member (Bethel portion) of Greenbrier (part); Gates & Bailey quarry at Aggregates; see p. 685.
25. Union member (Fredonia portion) of Greenbrier; Lewis Harris quarry, 2.7 miles west of Montrose; see p. 684.
26. Union member (Fredonia portion) of Greenbrier (upper 35′); Gates & Bailey quarry; at Aggregates; see p. 685.

27. Union member (Fredonia portion) of Greenbrier (middle 22'); Gates & Bailey quarry; at Aggregates; see p. 685.

28. Union member (Fredonia portion) of Greenbrier (lower 28'); Gates & Bailey quarry, at Aggregates; see p. 685.

29. Union member (Fredonia portion) of Greenbrier; Grace Hart Johnson property, 3.2 miles northwest of Beverly; see p. 685.

30. Union member (Fredonia portion) of Greenbrier; Richard Wamsley property, Cheat Mountain; see p. 686.

31. Union member (Fredonia portion) of Greenbrier; G. W. Daniels property, Cheat Mountain, 1 mile southeast of Millstone School; see p. 686.

32. Union member (Fredonia portion) of Greenbrier; Monongahela Construction Co. quarry; 0.4 mile southeast of Faulkner; see p. 687.

33. Union member (Fredonia portion) of Greenbrier (upper 15'); Standard Lime & Stone Co. quarry, 0.2 mile east of Bowden; see pp. 689-90.

34. Union member (Fredonia portion) of Greenbrier (middle 20'); Standard Lime & Stone Co. quarry, 0.2 mile east of Bowden; see pp. 689-90.

35. Union member (Fredonia portion) of Greenbrier (lower 20'); Standard Lime & Stone Co. quarry, 0.2 mile east of Bowden; see pp. 689-90.

36. Union member (Fredonia portion) of Greenbrier; John F. Nydegger property, 3.2 miles southwest of Mill Creek town; see p. 691.

37. Union member (Fredonia portion) of Greenbrier; F. P. Marshall Heirs property, 0.4 mile north of Mace; see p. 692.

38. Union member (Fredonia portion) of Greenbrier; Geo. W. Fretwell property, 0.3 mile south of Monterville; see p. 693.

39. Union member (Fredonia portion) of Greenbrier; E. R. Dyer property, 3.8 miles southwest of Alpena; see pp. 694-5.

40. Union member (Fredonia portion) of Greenbrier (20' ledge); Chas. Judy property, 2.1 miles northwest of Job; see p. 695.

41. Union member (Fredonia portion) of Greenbrier; Daniel Cooper Heirs property, 0.5 mile south of Harman; see pp. 695-6.

42. Union member (Fredonia portion) of Greenbrier; Ed. Lukens property, 1.3 miles northeast of Whitmer; see p. 697.

43. Union member (Fredonia portion) of Greenbrier; Bruce Yokum property, Yokum Knob near Osceola; see p. 697.

44. Patton member of Greenbrier; Geo. W. Fretwell property, 0.3 mile south of Monterville; see pp. 693 and 698.

45. Patton member of Greenbrier; F. P. Marshall Heirs property, 0.6 mile northwest of Mace; see p. 698.

46. Sinks Grove member of Greenbrier (upper part); F. P. Marshall Heirs property, 0.7 mile northwest of Mace; see p. 699.

47. Landes member of Genesee; Philip Ware property, 0.9 mile northwest of Whyte; see p. 700.

CHAPTER XII.

WATER-POWER, MINERAL WATERS, IRON ORE, MANGANESE, PRECIOUS METALS, AND FORESTS.

WATER-POWER

PRESENT DEVELOPMENT.

No utilization of the streams of Randolph County for hydroelectric power has been made. In the regions where coal is not readily available, however, and in pioneer days before the generation of steam power was common, small water-wheel mills have been built to grind grain and saw lumber for local needs. At present only a few of these small plants exist.

In December, 1929, the West Virginia Power and Transmission Company, of Pittsburgh, Pa., applied to the Public Service Commission of West Virginia for a permit to install a large hydroelectric project in the valley of Cheat River, embracing 14 developments, some of which were in Monongalia, Preston, and Tucker Counties, and three of which were entirely or partly in Randolph County. One of these developments called for a dam on Glady Fork approximately 210 feet high and seven miles below Glady town, from which the water could be carried by tunnel through Shavers Mountain to a power plant on Shavers Fork near Kight Siding above Bowden. Another called for a diversion dam 50 feet high on Shavers Fork seven miles above Bemis, from which the water could be carried by tunnel through Shavers Mountain to West Fork of Greenbrier about four miles south of Glady town; and also called for other dams to be located later near Pheasant Run, Tucker County, Pettit, Mt. Zion Church, Lumber, and Cheat Bridge, Randolph County, and near Spruce, Pocahontas County. Another called for developments on Dry Fork, including a dam or dams to be located in Dry Fork, Gandy Creek, Laurel Fork, Glady Fork, and/or Otter Creek near the towns of Hendricks, Horton, Wymer, Glady, and Evenwood.

In the hearing before the Public Service Commission, however, no evidence regarding these Randolph County projects was presented and no insistence made that a license for them be granted; and they were accordingly omitted from the license which was granted by the Commission on June 25, 1930, when authority was given to proceed with certain other developments on the main Cheat River in Monongalia, Preston, and Tucker Counties, and on the Blackwater River in Tucker County.

AVAILABLE STREAMS.

Tygart River.—The drainage basin of Tygart River has already been described, pages 62-8, and on pages 14-15 will be found a record of precipitation at Elkins. In the present Chapter, under the heading of "Records of Stream Measurement", will be found a record of discharge measurements taken for a number of years near Dailey.

There is no doubt that this river is capable of furnishing a considerable amount of power and a dam could be built in the gap between Laurel Ridge and Rich Mountain below Elkins that would create an enormous storage reservoir covering a large part of the valleys of Tygart River and Leading Creek. At the same time immense damage would be done to a thickly populated region and hence no such project would appear to have economic justification.

Buckhannon River.—The drainage basin of Buckhannon River has already been described on pages 68-70, and on pages 16-17 will be found a record of rainfall at Pickens. No gaging station has been established or maintained in any portion of this basin in Randolph County. Some hydroelectric power could be developed by building dams on Right Fork and Left Fork. On the former there is a railroad line and certain industrial plants with towns and villages and there are also minable coal seams which would be flooded. On Left Fork there are now no railroad lines within the county except along a small branch which passes Helvetia, but the Sewell and other valuable coals outcrop in close proximity to the river so that high dams would do great damage by creating an impossible railroad situation and by actual flooding of coal outcrops. It is not apparent that hydroelectric projects on either branch of this river would have economic justification.

Middle Fork River.—The drainage basin of Middle Fork River has already been described on pages 70-3. No record of rainfall has been kept at any point of this basin in Randolph County but in the present Chapter, under the heading of "Records of Stream Measurement", will be found discharge measurements and other similar data for Midvale. In this valley a considerable amount of hydroelectric power could be developed by building high dams, although no great amount of storage could be created on account of the narrow valley and rapid stream gradient. From the Barbour-Randolph County line southward nearly to the head of the Left Fork, however, there is a railroad line which carries out both timber and coal and this line will probably remain as there is a vast tonnage of good New River, Kanawha, and Allegheny coal to be recovered from the valley. Dams of any considerable height would do immense damage to this prospective industry which is already well started at Cassity and hence no considerable hydroelectric project could be advised.

Elk River.—The drainage basin of Elk River has already been described, pages 73-5. No record of rainfall has been kept at any point on this river in Randolph County and no stream-gaging stations have been maintained. In this valley there is enough water to develop a considerable amount of power and the coals are several hundred feet above drainage at all Randolph County points along main Elk and hence could not be flooded except by building dams which would be higher than any now in existence. Certain other features, however, are not so favorable. A railroad line, which serves the new and growing Webster County coal field and which for many years will carry a large tonnage of timber, extends along the river from Slaty Fork to Bergoo and Webster Springs and its relocation and maintenance at a higher level would be very expensive. Above Valley Fork, also, the immediate valley of the river is composed of cavernous limestone, making the stream intermittent or dry for a considerable portion of the year, and creating doubt about the ability of a dam to hold the water. Farther up the river in Pocahontas County the cavern situation becomes worse on account of the greater exposure of limestone and also this portion of the valley has rich land and is traversed by an important State road, although the railroad soon ascends to a level which would put it above dams of ordinary height. It is possible that a small plant could be erected at Whitaker Falls, taking advantage of approximately 30 feet of natural drop in the upper and lower falls, and with the addition of a 20-foot dam making a head of 50 feet. Such a project would be without adequate storage and the operation of the plant would therefore be intermittent.

Gauley River.—Only the extreme headwaters of Gauley River pass through Randolph County and any projected hydroelectric development would be handicapped by lack of watershed and lack of storage basin.

Shavers Fork of Cheat River.—The drainage basin of Shavers Fork of Cheat River has already been described, pages 76-83, and on page 18 is the record of rainfall at Cheat Bridge. No United States or State stream gaging has been done in the Randolph County part of this valley but for several years the West Virginia Power and Transmission Company has kept records at Bemis and Cheat Bridge which are published in the present Chapter under the heading "Records of Stream Measurement".

There is little doubt that the natural conditions along this river are favorable for the development of a vast amount of power. In that portion of the valley below Lumber Station there are no railroads or improved roads and only a few habitations, the land being very poor and little suited to agriculture. With the possible exception of limestone, which lies high up on the slope of McGowan Mountain, no minerals of present known value could possibly be affected, as the small acreage of coal in the extreme top of McGowan Mountain could be recovered from Otter Creek much more easily than from Shavers Fork. The limestone is too high to create any danger of seepage and dams of sufficient height to provide both storage and head would be possible. This portion of the valley, however, is of course a feasible route for a more direct railroad line from Bowden to Parsons and Hendricks, although a much shorter cut-off, capable of developing coal tonnage nearly all the way, could be built by way of Otter Creek.

In the vicinity of Meadows the Durbin Branch of the Western Maryland Railway descends to the flood-plain of Shavers Fork and so remains most of the way to Spruce, near the head of the river. From Lumber to Bowden, also, the Elkins-Franklin road follows the river closely; and from Faulkner to Weese Crossing, the limestones of the Greenbrier Series are wholly or partly above drainage, comprising a valuable mineral asset and creating much doubt as to storage ability on account of seepage through caverns. From Bowden nearly to Spruce, also, there are valuable minable coals both in Cheat Mountain west of the river and in Shavers Mountain on the east, mostly high on the mountains but only slightly above drainage for several miles in the vicinity of Linan, Whitmeadow, and Red Run Mines. All things considered, it would appear that the damages incident to the building of high dams between Lumber and Spruce would be prohibitive against hydroelectric development. At certain localities, where there are low cataracts and where the railroad is fairly high above the river, small dams to augment the head could possibly be built without great difficulty, and it is of course true that a diversion dam and tunnel to carry the water from the upper portion of the valley to Glady Fork would be comparatively simple and evidently without large damage to any present economic interest in the lower valley, especially if the water should be returned to Shavers Fork at Kight Siding by a second diversion tunnel.

Dry Fork of Cheat River.—The drainage basin of Dry Fork of Cheat River has already been described, pages 83-8, and on page 18 will be found a record of rainfall at Horton. No United States or State gaging stations have been maintained in its valley at any point in Randolph County but the West Virginia Power and Transmission Company and allied interests have made measurements on Gandy Creek at Horton, the records of which are published in the present Chapter under the subject of "Records of Stream Measurement".

In the Dry Fork Valley, exclusive of Glady and Laurel Forks which will be separately discussed, it is apparent that the possibilities for hydroelectric development are considerably limited by various factors. From the Tucker County line at Jenningston to Harman, and until quite recently to Horton and beyond, the flood-plain has been occupied by a railroad line, now reported to have been removed as far north as Harman. Between Harman and Job the Elkins-Franklin road follows the valley; and from Harman almost to the extreme head of Dry Fork there is cavernous limestone which would make difficult or impossible the storage of water. Storage without engineering difficulty and without any great damage to industrial interests would be possible on Gandy Creek above Horton, and also in the lower valley of Red Creek below Laneville, avoiding the cavernous limestone belt immediately adjacent to Laneville and making provision for the removal of the coals of the upper valley by means of a railroad around the comparatively flat Pocono-Greenbrier shelf from Harman to Laneville.

It is apparent that some limited hydroelectric development in these two portions of the valley might be possible but it is not evident that any great financial return from the enterprise could be expected.

Glady Fork of Cheat River.—A description of Glady Fork of Dry Fork of Cheat River has already been published, pages

84-5. No records of rainfall have been kept within its valley and no United States or State gaging stations have been maintained. At Evenwood, however, the West Virginia Power and Transmission Company and associated interests have kept measurements for several years, the records of which are published in the present Chapter under the heading of "Records of Stream Measurement".

On this stream the possibilities for the development of hydroelectric power appear to be very good. Its valley is practically uninhabited from its mouth to Evenwood and is without roads or railroads, the timber having been removed some years ago. At Evenwood it is crossed by the Elkins-Franklin road and there is a small village. From Evenwood to Glady town the immediate valley is uninhabited and without roads or railroads, there being a county road from Alpena to Glady along the high Pocono-Greenbrier shelf which is about 100 feet above the river at the former locality and which gently descends practically to the flood-plain at Glady town. From Glady town to the head of West Fork of Glady the valley is traversed by a railroad and there is a secondary road with a few farms. On Left Fork, from Glady town southeastward for two miles, the valley is traversed by the Glady-Osceola road but it is reported that the Chaffey Lumber Railroad has now been entirely removed. Above the Osceola road this valley is uninhabited.

Within the watershed of Glady coals exist only in the extreme top of Shavers Mountain, their removal by way of Shavers Fork and Otter Creek being more feasible than by way of Glady Fork. Limestones occur just above the Pocono-Greenbrier shelf, the level of which is approximately 600 feet above the river at the Tucker-Randolph County line and then gently descends to the flood-plain at Glady town. Any economic use of these limestones would presumably be handled from a transportation line along the shelf, above the level of which dams could hardly be built on account of the danger of seepage through caverns. No other minerals of present known value exist in this watershed, and, except along the Greenbrier and higher Mauch Chunk outcrop, there is not even good agricultural soil.

Laurel Fork of Cheat River.—A description of the drainage basin of Laurel Fork of Dry Fork of Cheat has already been published, pages 85-6. No records of rainfall have been kept in the valley and no United States or State gaging stations have been maintained. Measurements have been made near Wymer, however, by the West Virginia Power and Transmission Company and allied interests, the figures on which are published in the present Chapter under the heading of "Records of Stream Measurement".

On this stream also, the possibility for hydroelectric power appears to be very good. With the exception of a few houses from the Elkins-Franklin road near Wymer southward to Lambert Run, a distance of about two miles, the valley is apparently without human habitation, and it is without railroad lines. Near Wymer it is crossed by the Elkins-Franklin road but no town is left and it is again crossed by the Glady-Osceola road many miles farther up. From the Elkins-Franklin road to Lambert Run there is a secondary road but otherwise there is no lateral road. No coals exist in the watershed except in a few high peaks of Rich Mountain near Job, and if ever mined, these coals will probably be taken to Dry Fork. Limestone occurs in great abundance on the western slope of Rich Mountain but is everywhere above the probable height of any dams and if put to economic use will probably require a high-level railroad line along the Pocono-Greenbrier shelf which at most points is nearly a mile from the river. Agricultural soil scarcely exists below the level of this shelf and there are no other minerals of known value which would be flooded.

INDICATED HORSE-POWER OF STREAMS.

The following table, showing indicated horse-power developed by streams flowing through Randolph County, is compiled from Table 7, page 407, and Tables 12, 13, 14, and 15, pages 416-421, of the Semi-Centennial History of West Virginia by Dr. J. M. Callahan, the tables in question being part of a special article on "Water-Power Resources" by A. H. Horton, District Engineer, Water-Resources Branch, United States Geological Survey. From the original tables there have been eliminated all tributary streams and sections of the main rivers which are not principally in the county, but sections which come mainly within the county are included, the effort being made to set forth, as closely as the divisions of Mr. Horton permit, the water-power resources of the county:

Indicated Horse-Power Developed by Streams of Randolph County.

Stream.	Section. From	Section. To	Length. Miles.	Mean Drainage Area. Sq. Mi.	Minimum Discharge. Sec.-ft.	Assumed Discharge for Maximum Development. Sec-ft.	Total Fall. Feet.	Minimum Horse-Power.	Assumed Maximum Development. Horse-Power.	Horse-Power Available from Storage for 12 months.	6 months.	3 months.
Elk River	Source	Below Back Fork	40	(a)227	38	177	2,500	2,180	10,200	....	....	....
Tygart River	Source	Below Pound Mill Run	19	(a) 88	7	46	1,800	290	1,900	....	....	....
Tygart River	Below Pound Mill Run	2 mi. above Roaring Creek	31	205	16	106	280	412	2,700	....	....	....
Tygart River	2 mi. above Roaring Creek	Above Middle Fork	16½	379	30	197	250	690	4,530	12,900	25,800	51,600
Totals			....	.....	....	.....	....	1,392	9,130	....	....	....
Middle Fork	Source	Below Cassity Fork	15	(a) 65	5	34	1,200	138	940	....	....	....
Middle Fork	Below Cassity Fork	Mouth	25	113	9	59	540	447	2,930	....	....	....
Totals			....	.....	....	.....	....	585	3,870	....	....	....
Buckhannon River	Source	Alexander	17	(a) 90	7	47	1,300	209	1,410	....	....	....
Buckhannon River	Alexander	¼ mi. above Sand Run	33	200	16	104	470	692	4,490	....	....	....
Totals			....	.....	....	.....	....	901	5,900	....	....	....
Shavers Fork	Source	3,000-ft. Contour	30	(a) 88	24	59	1,500	826	2,030	....	....	....
Shavers Fork	3,000-ft. Contour.	Above Dry Fork	45	151	41	101	1,370	5,160	12,700	....	....	....
Totals			....	.....	....	.....	....	5,986	14,730	....	....	....
Dry Fork	Source	Above Laurel Fork	28	(a)145	39	97	2,300	2,060	5,130	....	....	....
Dry Fork	Below Laurel Fork	Cheat River	13	345	94	232	400	3,410	8,550	....	....	....
Totals			....	.....	....	.....	....	5,470	13,680	....	....	....
Laurel & Glady Forks	Source	Dry Fork	24	(a)123	33	83	1,800	1,370	3,440	....	....	....
Grand Totals			....	.....	....	.....	....	17,884	60,950	....	....	....

(a) Total area.

RECORDS OF STREAM MEASUREMENT.

The following tables, taken from Water-Supply Papers Nos. 403, 433, 453, 473, 503, 523, 543, 563, 583, and 603 of the United States Geological Survey, and from unpublished data supplied by Mr. A. H. Horton, District Engineer, give the records of all stream measurements made in Randolph County from the first establishment of gaging stations until the year 1928. This information is secured and compiled under the active supervision of the United State Geological Survey with the financial cooperation of the West Virginia Geological Survey and the Public Service Commission of West Virginia, and with the further cooperation of such other Government agencies, municipalities, or private corporations as may have established gaging stations.

Middle Fork River at Midvale.

Location.—About one-third mile above Midvale railroad station on the Coal & Coke Railroad, two-thirds mile below post-office at Ellamore, Randolph County. Laurel Creek enters river on right about 1¾ miles above station.

Drainage Area.—122 square miles (measured on topographic maps).

Records Available.—May 3, 1915, to September 30, 1928.

Gage.—Vertical and inclined staff on right bank; read twice daily, to hundredths, by Anna Riley.

Discharge Measurements.—Made from cable or by wading short distance below gage.

Channel and Control.—One channel at all stages; straight 300 feet above and 100 feet below cable section. Both banks are high and in most places wooded. Control probably permanent. Point of zero flow, gage height + 0.55±0.1 foot.

Extremes of Stage (1915).—Maximum stage recorded, 7.3 feet at 7:30 a. m. July 29; minimum stage recorded, 1.30 feet at 7 a. m. July 28. Floods of 1888 and 1912 reached gage height of approximately 18 feet.

Regulation.—None.

Accuracy.—Records good.

Cooperation.—Station maintained in cooperation with United States Engineer Corps.

Discharge Measurements of Middle Fork River at Midvale, W. Va. during the year ending September 30, 1915.

Date	Made by—	Gage height. Feet.	Discharge. Sec.-ft.
Apr. 30	Stewart and Archibald	3.82	512
May 2	J. E. Stewart	3.02	272
Sept. 15	B. J. Peterson	1.66	35.4

Daily Discharge, in second-feet, of Middle Fork River at Midvale, for the year ending September 30, 1915.

Day	May	June	July	Aug.	Sept.	Day	May	June	July	Aug.	Sept.
1915						1915					
1	--	350	17	48	89	16	89	244	15	24	25
2	--	294	28	34	60	17	82	158	35	82	18
3	209	350	21	38	52	18	75	112	52	178	17
4	178	380	27	33	56	19	68	82	40	104	60
5	158	294	25	25	55	20	68	62	29	62	120
6	138	188	--	18	46	21	82	52	38	55	232
7	112	148	25	16	39	22	104	57	38	57	220
8	112	129	18	14	55	23	129	46	31	89	120
9	89	89	31	28	48	24	120	36	25	82	82
10	82	75	33	42	42	25	120	31	21	75	62
11	68	62	26	27	33	26	112	25	20	68	49
12	75	68	40	23	28	27	138	23	14	52	52
13	120	48	33	30	27	28	112	43	10	62	48
14	104	1,340	25	28	27	29	138	35	15	96	38
15	96	442	16	27	36	30	158	35	26	112	35
						31	618	---	82	104	--

Monthly Discharge of Middle Fork River at Midvale, for the year ending September 30, 1915.

(Drainage area, 122 square miles).

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1915					
May 3-31	618	68	129	1.06	1.14
June	1,340	23	177	1.45	1.62
July	82	10	28.6	0.234	0.27
August	178	14	55.9	0.458	0.52
September	232	14	62.4	0.511	0 57

Extremes of Discharge.—Maximum stage recorded during 1915-16. 9.3 feet at 7 p. m. December 18, 1915 (discharge, about 3,680 second-feet); minimum stage, 1.20 feet at 7 p. m. September 1, 1916 (discharge, 5 second-feet).

Accuracy.—Stage-discharge relation practically permanent; not affected by ice this year (1916). Rating curve well defined below, but extension above 1,600 second-feet. Gage read twice daily to hundredths. Discharge ascertained by applying mean daily gage heights to rating table. Results excellent.

Discharge Measurements of Middle Fork River at Midvale, during the year ending September 30, 1916.

Date.	Made by—	Gage height. Feet.	Discharge. Sec.-ft.
Mar. 23	J. E. Stewart	5.38	1,200
Mar. 24	J. E. Stewart	4.58	838
Sept. 17	Lasley Lee	2.54	165

Daily Discharge, in second-feet, of Middle Fork River at Midvale, for the year ending September 30, 1916.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
	1915			1916								
1	970	46	104	740	1,240	209	336	232	178	79	11	7
2	1,180	47	112	2,250	922	322	410	209	148	62	9	9
3	474	44	92	1,020	580	442	442	188	209	112	7	18
4	294	39	95	580	508	350	580	256	178	95	7	13
5	220	38	79	410	336	308	442	244	138	65	54	13
6	198	38	89	474	294	322	380	232	138	48	129	9
7	158	38	83	442	922	2,250	294	380	138	41	120	9
8	120	38	83	350	618	1,940	244	410	148	36	62	9
9	92	46	86	474	544	740	232	322	120	33	42	102
10	81	39	81	336	508	508	198	268	120	35	37	60
11	70	35	100	2,900	410	380	281	232	112	32	31	34
12	52	42	104	2,700	410	281	322	178	83	25	72	24
13	52	95	104	1,340	3,280	294	281	158	67	129	57	18
14	42	104	129	658	1,070	1,070	322	138	62	100	46	178
15	42	2,380	148	508	658	2,000	281	138	79	52	42	1,460
16	40	1,070	244	442	410	874	256	148	65	48	33	365
17	37	508	2,130	308	336	442	350	322	75	75	32	138
18	35	350	3,610	474	281	410	350	294	58	112	33	83
19	104	294	1,570	508	232	350	281	220	129	67	22	57
20	158	308	698	508	158	281	220	178	178	46	18	46
21	138	294	442	1,020	294	281	220	138	148	38	17	39
22	120	294	308	740	268	1,940	209	129	168	35	15	35
23	101	244	268	874	268	1,400	168	129	120	30	10	33
24	86	198	209	580	244	618	256	112	100	25	11	28
25	79	168	188	410	410	544	442	95	1,070	18	23	25
26	72	138	350	322	410	365	618	410	508	24	17	22
27	75	138	308	268	308	336	508	410	281	25	10	20
28	72	129	474	209	281	410	410	268	178	17	14	17
29	62	120	1,880	220	244	474	350	198	112	25	18	168
30	57	120	1,880	922	---	474	281	268	92	15	12	232
31	48	---	874	922	---	410	--	220	---	14	9	---

Monthly Discharge of Middle Fork River at Midvale. for the year ending September 30, 1916.

(Drainage area, 122 square miles).

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1915-16					
October	1,180	35	172	1.41	1.63
November	2,380	35	248	2.03	2.26
December	3,610	79	546	4.48	5.16
January	2,900	209	771	6.32	7.29
February	3,280	158	567	4.65	5.02
March	2,250	209	678	5.56	6.41
April	618	168	332	2.72	3.04
May	410	95	230	1.89	2.18
June	1,070	58	173	1.42	1.58
July	129	14	50.3	0.412	0.48
August	129	7	32.9	0.242	0.28
September	1,460	7	109	0.894	1.00
The year	3,610	7	326	2.67	36.33

Extremes of Discharge (1917).—Maximum stage recorded during year, 10.67 feet at 7 a. m. March 12, 1917 (discharge, about 4,590 second-feet); minimum stage, 1.12 feet at 7 a. m. August 29, 1917 (discharge, 2.6 second-feet).

Accuracy.—Stage-discharge relation practically permanent; affected by ice to slight extent December 19-21, January 12-15, and considerably February 2-17. Rating curve well defined below 1,600 second-feet; above this point, curve is an extension. Gage read twice daily to hundredths. Discharge ascertained by applying mean daily gage heights to rating table. Daily discharge for periods in December and January affected by ice are probably in error to a small extent. Estimated mean flow February 2-17 may be considerably in error; records for rest of year are excellent.

The following discharge measurements were made during the year by B. E. Jones and by Peterson and Hopkins, respectively:

April 7, 1917: Gage height, 2.97 feet; discharge, 261 second-feet.

September 27, 1917: Gage height, 1.22 feet; discharge, 5.1 second-feet.

Daily Discharge, in second-feet, of Middle Fork River at Midvale, for the year ending September 30, 1917.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
	1916			1917								
1	138	44	112	322	410	784	178	308	474	36	25	10
2	104	36	101	220	365	474	168	232	442	25	23	11
3	71	34	94	474		1,020	158	138	322	20	18	8.2
4	57	33	92	658		1,460	120	168	158	16	15	7.4
5	46	31	158	698		1,290	129	168	198	14	13	5.8

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
6	40	32	220	1,510		784	268	129	188	13	11	5.8
7	35	27	178	828		618	294	120	198	14	9	38
8	34	28	158	380		2,960	658	138	168	30	35	178
9	38	28	148	365		1,630	544	380	148	21	21	120
10	86	38	120	268	290	828	474	294	148	20	31	62
11	67	44	120	178		2,250	658	281	148	20	27	42
12	55	36	120	158		4,000	658	244	112	18	20	30
13	50	39	104	198		2,380	580	188	92	17	13	20
14	49	43	95	508		2,380	380	178	83	14	12	18
15	46	46	98	580		1,290	294	158	89	18	10	17
16	61	49	112	544		740	220	138	81	70	9	11
17	96	46	112	442		658	178	120	65	54	9	10
18	104	49	112	350	442	580	168	104	57	44	8.2	8.2
19	148	48	112	220	658	474	148	98	47	44	6.6	6.6
20	256	46	112	138	1,760	380	129	89	60	36	5.0	6.6
21	158	42	256	1,510	874	508	120	89	52	40	3.8	6.6
22	129	40	1,340	3,740	544	922	112	78	42	158	3.5	10
23	104	48	698	1,180	442	698	94	138	36	104	4.1	22
24	86	268	410	740	2,070	740	95	120	33	88	5.0	13
25	74	268	322	410	1,120	740	86	92	33	72	9.6	9
26	67	198	256	308	658	410	86	83	28	112	6 2	7.8
27	58	158	268	148	1,240	410	81	3,020	25	94	4.4	6.6
28	48	120	2,000	232	1,120	336	104	2,250	46	75	3.2	7.4
29	46	112	1,070	268	-----	294	178	2,830	42	50	2.6	14
30	44	120	618	380	-----	244	410	1,400	46	36	3.2	13
31	40	-----	365	336	-----	209	----	698	----	33	5.8	-----

Note.—Daily discharge Feb. 3-17 estimated because of ice from study of climatic data, gage readings, and gage observer's notes. Braced figures show mean discharge for period included.

Monthly Discharge of Middle Fork River at Midvale, for the year ending September 30, 1917.

Month.	Discharge in second-feet. Maximum	Minimum.	Mean.	Per square mile.	Run-off in inches.
1916-17					
October	256	34	78.5	0.643	0.74
November	268	27	71.7	0 588	0.66
December	2,000	92	325	2.66	3.07
January	3,740	138	590	4.84	5.58
February	2,070	----	573	4.70	4 89
March	4,000	209	1,050	8.61	9.93
April	658	81	259	2.12	2.36
May	3,020	78	467	3.83	4.42
June	474	25	122	1.00	1.12
July	158	13	45.4	0.372	0.43
August	35	2.6	12.0	0.098	0.11
September	178	5.8	24.2	0.198	0.22
The year	4,000	2.6	301	2.47	33.53

Extremes of Stage (1918).—Maximum stage recorded during year, 16.1 feet at 7:30 a. m. January 28 (stage-discharge relation affected by ice); minimum stage recorded, 1.25 feet at 7 a. m. August 8 and 30.

The following discharge measurement was made by B. L. Hopkins: May 4, 1918: Gage height, 2.55 feet; discharge, 184 second-feet.

Daily Discharge, in second-feet, of Middle Fork River at Midvale, for the year ending September 30, 1918.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1917				1918								
1	12	152	318		345	495	124	267	128	218	33	132
2	7.5	106	292		280	432	109	218	93	162	21	62
3	7.0	85	230		267	359	184	195	82	106	16	37
4	7.0	68	184		132	305	195	184	65	82	12	37
5	7.5	56	142		292	388	173	152	52	62	9.0	31
6	8.5	48	119		359	388	162	142	45	57	7.5	27
7	10	43	106		463	1,020	162	142	206	43	7.0	31
8	10	33	90		887	758	218	800	162	39	29	26
9	11	34			1,900	600	887	638	92	33	31	20
10	12	35			1,770	564	677	463	69	27	55	16
11	13	29			978	463	529	359	55	24	48	12
12	16	31			758	432	495	292	45	19	34	12
13	24	35	45		758	4,450	432	280	41	20	184	13
14	31	29			529	2,840	388	1,170	36	29	95	12
15	24	24		376	600	2,280	978	717	27	20	68	10
16	20	27			463	1,020	758	463	23	16	46	8
17	14	26	58		305	638	529	318	35	14	31	20
18	14	24	65		195	432	402	242	184	35	25	292
19	20	24	64		242	332	332	206	89	31	92	218
20	71	24	69		2,150	267	292	218	62	41	51	195
21	55	24	78		1,020	280	388	162	43	24	34	332
22	37	26	99		600	345	463	173	109	16	24	173
23	31	33	109		280	305	402	402	92	12	16	121
24	33	44	152		463	292	373	359	62	9.0	17	84
25	52	29			564	305	388	1,900	52	7.5	16	62
26	99	29			3,330	280	359	1,840	932	17	12	50
27	267	33			1,170	230	432	677	345	14	9.0	42
28	242	57	432		677	206	359	463	195	12	8.0	34
29	152	402		2,490	-----	173	345	305	254	8.0	7.0	31
30	292	359		978	-----	152	292	242	218	9.0	7.0	27
31	218	-----		600	-----	132	----	173	----	29	60	----

Note.—Stage-discharge relation affected by ice Dec. 9-16, 25-31, 1917, and Jan. 1-28, 1918; discharge estimated.

Monthly Discharge of Middle Fork River at Midvale, for the year ending September 30, 1918.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1917-18					
October	292	7.0	58.6	0.480	0.55
November	402	24	65.6	0.538	0.60
December	----	----	179	1.47	1.70
January	----	----	471	3.86	4.45
February	3,330	132	778	6.38	6.64
March	4,450	132	683	5.60	6.46
April	978	109	394	3.23	3.60
May	1,900	142	457	3.75	4.32
June	932	23	130	1.07	1.19
July	218	7.5	39.9	0.327	0.38
August	184	7.0	35.6	0.292	0.34
September	332	8.0	72.2	0.592	0.66
The year	4,450	7.0	277	2.27	30.89

Extremes of Stage (1919).—Maximum stage recorded during the year 9.99 feet at 7:30 a. m. January 2; minimum stage, 1.19 feet at 7:30 a. m. September 21.

No discharge measurements of Middle Fork River at Midvale were made during the year ending September 30, 1919.

Daily Discharge, in second-feet, of Middle Fork River at Midvale, for the year ending September 30, 1919.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1918				1919								
1	19	800	218	4240	117	529	242	162	92	55	60	45
2	20	887	184	3820	132	529	206	242	76	43	87	40
3	19	280	162	1380	122	402	195	230	60	33	55	27
4	17	206	152	932	109	318	184	206	43	26	39	22
5	14	162	124	432	117	345	173	195	37	21	33	17
6	17	128	128	432	73	600	162	162	36	20	97	16
7	20	104	230	373	106	529	142	162	29	17	89	13
8	21	89	218	280	102	432	132	267	37	14	64	12
9	17	73	267	280	128	388	100	332	52	14	43	12
10	16	68	2560	195	84	318	108	1020	29	15	35	9.0
11	14	61	1710	267	93	280	132	843	20	132	29	10
12	17	53	1070	230	89	242	206	638	19	49	31	13
13	76	50	600	218	89	218	173	463	17	132	32	14
14	46	45	432	195	117	195	173	373	16	152	26	10
15	33	43	717	402	152	173	162	305	26	388	22	8.0
16	28	41	758	345	142	152	184	242	37	2490	29	7.5
17	25	41	432	332	152	142	254	345	28	978	20	7.0
18	24	218	318	932	142	218	254	345	19	432	19	5.5
19	20	373	242	978	117	242	242	292	14	373	37	5.5
20	22	495	195	600	142	230	218	280	13	564	35	5.0

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
21	27	717	173	432	173	218	218	332	24	800	26	5.0
22	45	432	195	332	373	184	184	305	16	388	106	7.0
23	37	305	402	564	564	162	162	345	11	230	82	87
24	33	218	402	800	432	152	373	318	12	142	55	95
25	32	173	529	600	359	132	292	495	24	106	40	39
26	44	132	463	432	495	117	242	402	388	62	33	33
27	49	113	373	318	402	184	206	318	359	53	26	22
28	50	195	292	267	373	432	173	267	242	43	44	20
29	51	318	230	195	-----	373	173	195	142	39	39	16
30	292	267	162	152	-----	345	152	173	84	33	32	13
31	843	-----	305	152	-----	305	----	102	-----	27	43	-----

Monthly Discharge of Middle Fork River at Midvale, for the year ending September 30, 1919.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum	Minimum.	Mean.	Per square mile.	
1918-19					
October	843	14	64.1	0.525	0.60
November	887	41	236	1.93	2.15
December	2.560	124	459	3.76	4.34
January	4,240	152	681	5.58	6.43
February	564	73	196	1.61	1.68
March	600	117	293	2.40	2.77
April	373	100	194	1 59	1.77
May	1,020	102	334	2.74	3.16
June	388	11	66.7	0.546	0.61
July	2,490	14	254	2.08	2.40
August	106	19	45.4	0.372	0.43
September	95	5.0	21.2	0 174	0.19
The year	4,240	5.0	239	1.96	26.53

Extremes of Stage (1920).—Maximum stage recorded during the year, 9.65 feet at 7:30 a. m. December 7; minimum stage, 1.20 feet at 7 a. m. September 27.

Discharge Measurements of Middle Fork River at Midvale, during the year ending September 30, 1920.

Date.	Made by—	Gage height.	Discharge
		Feet.	Sec.-ft.
May 18	Peterson and Bigwood	2.84	256
June 18	B. L. Bigwood	2.14	106

Daily Discharge, in second-feet, of Middle Fork River at Midvale, for the year ending September 30, 1920.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1919				1920								
1	12	373	254		162	242	109	1320	84	22	45	33
2	10	2220	206		162	218	122	600	73	29	71	29
3	9.0	978	162		128	218	106	432	73	95	41	22
4	8.0	529	132		206	388	106	318	292	117	33	16
5	8,0	373	132	160		800	173	280	345	79	29	16
6	13	254	132		173	677	162	206	292	53	20	14
7	57	195	3960			432	218	173	218	55	62	12
8	31	152	1220			332	292	152	162	65	65	10
9	20	126	677	2770		280	345	128	126	45	45	12
10	19	113	529	1120	432	242	345	117	95	35	40	22
11	18	106	402	638	638	254	292	104	75	36	65	35
12	195	102	359	432	463	402	267	142	71	55	48	26
13	267	100	932	305	388	1840	345	1270	68	44	48	27
14	267	85	1840	152	292	978	292	800	65	34	69	20
15	1270	73	887	242	305	677	267	600	60	34	60	16
16	564	73	564	254	242	843	267	432	65	58	152	12
17	887	71	432	402	280	1430	388	318	60	45	95	13
18	529	65	280	345	254	843	600	254	89	37	71	13
19	292	62	292	345	242	2350	495	230	62	31	60	10
20	184	57	242	292	218	2020	495	206	52	35	126	8.0
21	152	45	206	1430	388	978	2700	195	79	26	92	7.0
22	843	60		2080	1120	638	1840	184	85	21	124	7.0
23	638	85		2980	1070	495	1020	173	71	17	184	6.0
24	800	89		2150	1120	373	495	152	68	82	195	5.5
25	529	184		1600	758	318	388	345	60	717	152	6.0
26	359	1480	160	717	463	254	318	292	50	359	109	5.5
27	388	1480		402	463	218	292	230	41	195	79	5
28	345	978		373	345	195	345	184	33	128	65	42
29	230	564		267	254	152	318	152	24	79	52	48
30	184	359		152	-----	128	318	132	24	62	43	33
31	173	-----	130	195	-----	117	----	102	-----	50	43	----

Note.—Stage-discharge relation affected by ice Dec. 22-30, 1919, Jan. 1-18, and Feb. 5-9, 1920; discharge estimated.

Monthly Discharge of Middle Fork River at Midvale, for the year ending September 30, 1920.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1919-20					
October	1,270	8.0	300	2.46	2.84
November	2,220	45	381	3.12	3.48
December	3,960	----	497	4.07	4.69
January	2,980	----	675	5.53	6.38
February	1,120	128	388	3.18	3.43

March	2,350	117	624	5.11	5.89
April	2,700	106	457	3.75	4.18
May	1,320	102	330	2.70	3.11
June	345	24	98.8	0.810	0.90
July	717	17	88.4	0.725	0.84
August	195	20	76.9	0.630	0.73
September	48	5.5	17.7	0.145	0.16
The year	3,960	5.5	328	2.69	36.63

Extremes of Stage (1921).—Maximum stage recorded, 9.10 feet at 7 a. m. May 30; minimum stage, 1.33 feet at 7 a. m. July 29.

Discharge Measurements of Middle Fork River at Midvale, during the year ending September 30, 1921.

Date.	Made by—	Gage height.	Discharge
		Feet.	Sec.-ft.
Nov. 13	Bigwood and Lamoureux	2.00	73
May 9	Bigwood and Lamoureux	3.09	329
June 23	B. L. Bigwood	2.20	119

Daily Discharge, in second-feet, of Middle Fork River at Midvale, for the year ending September 30, 1921.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1920				1921								
1	173	28	305	173	218	529	267	345	529	173	36	60
2	184	31	318	206	195	529	280	292	402	152	31	35
3	95	173	318	184	195	2840	254	267	242	90	638	39
4	95	95	318	184	184	1170	218	332	173	60	432	195
5	99	73	359	173	184	717	184	1120	130	43	206	119
6	76	60	345	152	254	463	162	800	99	43	121	119
7	55	51	305	142	242	345	152	564	76	33	117	463
8	48	48	254	280	280	267	132	402	68	26	195	195
9	41	48	206	463	677	242	373	305	53	267	121	142
10	33	152	173	373	932	332	402	254	51	254	79	95
11	27	121	195	292	564	292	345	218	50	128	58	71
12	24	100	173	195	529	267	280	184	48	142	46	65
13	20	76	195	162	463	242	242	152	58	463	62	55
14	19	50	292	267	318	206	206	128	82	318	332	41
15	16	68	402	432	292	267	195	106	45	142	800	33
16	16	79	359	318	267	267	173	92	35	184	388	32
17	14	529	267	292	242	267	152	82	35	117	254	27
18	14	242	184	184	206	267	162	76	142	84	195	29
19	13	195	142	218	195	242	152	65	638	173	128	26
20	12	173	195	206	173	206	142	57	242	68	99	20
21	13	142	173	195	152	184	142	52	132	79	71	20
22	13	318	230	292	152	173	132	48	92	52	55	184
23	12	463	1430	495	173	152	142	48	132	40	43	73
24	13	373	887	564	206	152	128	50	230	30	38	50
25	14	345	600	432	206	184	102	82	152	22	31	45

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
26	14	345	373	305	173	173	100	218	218	20	26	60
27	22	305	292	254	206	162	280	218	132	17	23	60
28	89	345	267	184	463	162	677	142	99	13	17	62
29	62	373	218	173	-----	173	463	402	162	12	17	55
30	38	318	206	195	-----	152	388	3050	267	99	16	53
31	33	-----	195	242	-----	142	----	1020	-----	162	19	-----

Monthly Discharge of Middle Fork River at Midvale, for the year ending September 30, 1921.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1920-21					
October	184	12	45.1	0.370	0.43
November	529	28	191	1.57	1.75
December	1,430	142	328	2.69	3.10
January	564	142	265	2.17	2.50
February	932	152	298	2.44	2.54
March	2,840	142	380	3.11	3.58
April	677	100	234	1.92	2.14
May	3,050	48	360	2.95	3.40
June	638	35	160	1.31	1.46
July	463	12	113	0.926	1.07
August	800	16	151	1.24	1.43
September	463	20	84.1	0.689	0.77
The year.	3,050	12	217	1.78	24.17

Extremes of Stage (1922).—Maximum stage recorded, 9.04 feet at 7 a. m. February 11; minimum stage, 1.20 feet at 6:30 p. m. September 30.

Discharge Measurements of Middle Fork River at Midvale, during the year ending September 30, 1922.

Date	Made by—	Gage height.	Discharge
		Feet.	Sec.-ft.
Feb. 19	Dirzulaitis and Bigwood	3.30	360
June 7	J. J. Dirzulaitis	2.04	98

Daily Discharge, in second-feet, of Middle Fork River at Midvale for the year ending September 30, 1922.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1921				1922								
1	81	2350	677	195	117	280	1120	173	43	48	50	22
2	58	887	495	173	162	1770	800	152	50	48	41	31
3	305	600	529	184	142	932	529	162	60	173	33	49
4	432	388	463	206	109	677	388	305	62	495	35	40
5	373	292	432	318	113	529	292	432	78	373	32	27

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
6	254	195	373	373	109	564	230	758	195	195	29	21
7	162	162	318	332	113	843	195	564	71	124	27	17
8	162	142	332	280	95	717	173	373	62	102	206	16
9	173	132	332	345	124	564	142	292	69	108	206	16
10	132	152	292	292	124	564	130	242	68	84	162	14
11	106	142	292	432	3400	600	121	195	61	71	89	12
12	85	132	332	432	1430	564	128	173	463	52	64	13
13	76	124	463	305	1480	463	104	152	184	106	49	31
14	62	195	432	292	758	402	318	128	152	184	44	20
15	55	267	345	242	758	1120	2420	109	99	113	73	9.0
16	43	292	318	218	600	1020	800	95	65	206	58	8.5
17	42	1380	495	218	402	638	529	93	402	132	52	8.0
18	41	717	1960	242	345	432	529	100	1770	130	53	6.5
19	42	495	932	1540	373	332	463	173	432	184	45	6.0
20	45	463	600	1710	1540	292	388	132	280	119	37	6.0
21	56	495	463	1380	1430	242	373	108	218	89	31	7.5
22	49	373	402	1070	843	206	388	97	142	68	21	7.5
23	41	280	2020	677	564	195	332	79	111	55	16	7.0
24	43	529	3330	402	402	305	280	70	81	162	17	6.0
25	35	1660	1480	345	305	388	254	60	62	195	130	6.5
26	31	800	843	280	254	345	267	87	52	152	82	6.0
27	32	758	432	230	267	305	254	111	42	102	52	6.0
28	32	2350	280	206	280	280	230	87	57	73	43	5.5
29	35	1660	218	184	-----	230	218	68	132	75	34	5.5
30	31	932	195	142	-----	242	195	57	68	58	27	5.0
31	69	-----	195	124	-----	388	----	52	-----	79	24	-----

Note.—No gage-height record May 24, 1922; discharge interpolated.

Monthly Discharge of Middle Fork River at Midvale, for the year ending September 30, 1922.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum	Minimum.	Mean.	Per square mile.	
1921-22					
October	432	31	103	0.844	0.97
November	2,350	124	645	5.29	5.90
December	3,330	195	654	5.36	6.18
January	1,710	124	431	3.53	4.07
February	3,400	95	594	4.87	5.07
March	1,770	195	530	4.34	5.00
April	2,420	104	420	3.44	3.84
May	758	52	183	1.50	1.73
June	1,770	42	188	1.54	1.72
July	495	48	134	1.10	1.27
August	206	16	60.1	0.493	0.57
September	49	5	14.5	0.119	0.13
The year	3,400	5	328	2.69	36.45

Extremes of Stage (1923).—Maximum stage recorded, 9.98 feet at 5 p. m. February 1; minimum stage, 1.17 feet at 6:30 p. m. October 1, 7 a. m. October 2, 7 a. m. October 23, and 7 p. m. September 3.

The following discharge measurement was made by Dirzulaitis and Wallace:

April 1, 1923: Gage height, 2.04 feet; discharge, 98 second-feet.

Daily Discharge, in second-feet, of Middle Fork River at Midvale for the year ending September 30, 1923.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1922				1923								
1	4.5	6.5	13	800	3470	638	162	152	55	280	529	7.5
2	4.5	6.0	14	638	2770	463	117	132	48	206	529	6.0
3	5.0	7.0	17	402	1660	402	106	124	41	152	359	4.5
4	5.5	7.5	20	292	932	373	109	113	35	121	373	7.0
5	5.0	7.0	267	230	600	318	124	106	30	82	359	10
6	4.5	7.0	195	195	402	432	230	102	33	65	345	8.0
7	5.0	10	230	184	280	843	206	89	62	62	142	13
8	5.0	13	463	206	230	677	206	92	142	73	162	22
9	5.0	14	305	267	206	495	184	267	87	71	173	37
10	8.0	13	206	432	242	564	162	280	61	48	142	20
11	14	13	142	318	230	887	142	402	267	43	843	12
12	18	12	132	292	195	843	128	432	887	218	345	10
13	14	12	173	230	2080	758	184	495	1430	130	600	10
14	10	12	152	254	677	564	758	463	1170	84	332	8.0
15	8.0	12	373	677	529	388	638	373	564	55	195	7.0
16	7.5	20	373	529		432	463	600	463	45	142	6.0
17	7.5	31	1320	359		677	373	463	292	39	99	6.0
18	8.0	24	800	305		564	292	373	195	26	95	7.0
19	9.0	26	432	318		495	242	318	152	19	68	8.5
20	10	37	242	292		495	195	218	106	13	55	22
21	9.0	26	195	402	140	359	173	206	95	9.0	45	99
22	6.0	20	152	978		305	142	173	69	57	40	82
23	4.5	19	117	677		463	128	152	55	48	33	41
24	8.0	17	99	800		1120	113	152	463	57	29	27
25	19	16	84	843		717	99	128	1770	887	25	20
26	16	14	73	529		495	89	117	463	173	20	17
27	12	14	71	564	495	373	82	106	495	132	17	13
28	11	13	73	1320	887	280	92	92	280	318	20	8.0
29	8.0	13	79	1270	-----	206	218	79	564	463	22	6.0
30	7.5	12	60	677	-----	195	162	68	463	529	16	7.0
31	7.5	-----	85	717	-----	162	----	60	-----	887	13	-----

Note.—Stage-discharge relation affected by ice Feb. 16-26, 1923; discharge estimated.

Monthly Discharge of Middle Fork River at Midvale, for the year ending September 30, 1923.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1922-23					
October	19	4.5	8.6	0.070	0.08
November	37	6.0	15.1	0.124	0.14
December	1,320	13	224	1.84	2.12
January	1,320	184	516	4.23	4.88
February	3,470	----	622	5.10	5.31
March	1,120	162	516	4.23	4.88
April	758	82	211	1.73	1.93
May	600	60	223	1.83	2.11
June	1,770	30	361	2.96	3.30
July	887	9.0	174	1.43	1.65
August	843	13	199	1.63	1.88
September	99	4.5	18.4	0.151	0.17
The year	3,470	4.5	256	2.10	28.45

Extremes of Stage (1924).—Maximum stage recorded, 13.94 feet at 6:30 a. m. May 12; minimum stage, 1.22 feet at 7 a. m. October 19 and 6 p. m. October 20.

The following discharge measurement was made by Wiggins and Mussey:
June 22, 1924: Gage height, 1.79 feet; discharge, 51 second-feet.

Daily Discharge, in second-feet, of Middle Fork River at Midvale, for the year ending September 30, 1924.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1923				1924								
1	8.0	33	195	1770	230	254	529	1600	529	108	242	26
2	8.0	24	173	843	206	318	388	887	432	79	128	142
3	7.5	16	162	3190	206	292	359	638	318	62	89	218
4	7.5	17	142	1710	195	292	402	564	267	56	52	99
5	7.0	44	162	978	218	388	388	529	206	57	40	82
6	7.0	60	206	463	318	717	402	432	173	106	31	71
7	6.0	373	206		218	564	843	388	152	124	31	58
8	7.0	242	267	167	195	432	677	388	142	184	37	49
9	7.0	142	529		218	332	564	2490	638	162	26	76
10	7.0	97	1120	758	195	292	432	1270	1270	128	24	432
11	7.0	73	1320	600	184	242	345	758	600	108	14	242
12	6.0	62	758	758	184	254	292	6760	402	97	26	152
13	6.0	60	402	495	162	206	230	2770	318	1220	27	106
14	6.0	51	529	345	152	173	206	1320	318	463	16	90
15	7.0	45	432	267	142	162	173	1270	230	305	12	76

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
16	7.0	48	373	280	106	162	152	843	184	195	8.5	62
17	6.0	62	292	529	230	267	142	564	128	115	14	57
18	6.0	102	254	432	2630	373	152	402	102	106	24	60
19	5.5	102	184	373	1660	463	195	402	79	173	19	62
20	5.5	93	184	242	3890	463	230	359	62	60	85	57
21	6.0	82	218	152	1660	717	254	463	56	48	373	95
22	7.5	87	388		843	495	254	463	48	12	132	102
23	8.5	78	2770		564	388	218	402	49	82	92	132
24	14	529	1840		318	373	195	332	39	53	73	109
25	20	373	887		292	359	184	318	35	33	75	85
26	24	254	529	167	254	600	162	267	29	26	93	71
27	19	218	432		254	1320	184	242	162	22	62	62
28	16	173	3610		254	1020	152	267	117	17	50	56
29	13	152	1380		242	3120	432	843	173	16	40	104
30	13	195	800	218	-----	1710	495	1710	162	16	33	2840
31	23	-----	2840	195	-----	887	----	843	-----	24	26	-----

Note.—Stage-discharge relation affected by ice Jan. 7-9, 22-29, 1924; discharge estimated.

Monthly Discharge of Middle Fork River at Midvale, for the year ending September 30, 1924.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1923-24					
October	24	5.5	9.61	0.079	0.09
November	529	16	130	1.07	1.19
December	3,610	142	761	6.24	7.19
January	3,190	----	530	4.34	5.00
February	3,890	106	559	4.58	4.94
March	3,120	162	569	4.66	5.37
April	843	142	321	2.63	2.93
May	6,760	242	993	8.14	9.38
June	1,270	29	247	2.02	2.25
July	1,220	12	137	1.12	1.29
August	373	8.5	64.3	0.527	0.61
September	2,840	26	196	1.61	1.80
The year	6,760	5.5	377	3.09	42.04

Extremes of Discharge (1925).—Maximum stage recorded, 7.46 feet at 7 a. m. March 19 (discharge, 2,490 second-feet; minimum stage, 1.04 feet at 6 a. m. September 12 (discharge, 2.5 second feet). No discharge measurements were made in 1925.

Daily Discharge, in second-feet, of Middle Fork River at Midvale, for year ending September 30, 1925.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1924				1925								
1	932	35	113	280	345	242	432	677	57	71	61	16
2	495	50	132	242	529	529	463	932	50	79	45	7.5
3	345	43	132	305	1220	529	529	677	50	402	31	10
4	184	29	106	318	677	359	495	495	41	292	26	8.5
5	132	29	126	267	495	305	512	463	36	173	26	12
6	109	26	600	230	388	267	529	402	39	119	22	12
7	92	22	717	184	345	230	402	345	218	89	16	7.5
8	81	24	677	184	318	218	318	292	432	85	13	5.5
9	73	28	600	142	292	195	254	242	345	87	13	3.5
10	65	39	463	152	267	173	206	218	432	68	13	3.0
11	58	35	345	242	242	173	206	529	242	73	11	2.5
12	55	29	267	432	254	195	162	1120	162	72	9.0	2.5
13	50	27	184	432	242	218	142	638	113	71	23	5.0
14	48	29	280	345	195	332	119	432	89	52	20	29
15	44	43	254	292	932	318	109	318	73	43	24	16
16	42	124	242	280	1170	292	97	242	90	35	13	152
17	41	82	218	1170	677	292	106	292	99	48	6.0	130
18	36	72	218	978	463	305	106	218	254	55	7.5	58
19	35	61	206	800	345	2150	102	184	242	40	7.0	37
20	36	57	206	1020	280	978	117	152	142	29	6.5	26
21	34	58	142	800	230	600	95	142	106	142	8.0	27
22	32	65	184	600	162	402	97	121	79	638	7.5	40
23	31	162	230	402	173	305	117	102	68	292	10	31
24	31	230	254	267	184	242	102	95	68	206	6.0	76
25	29	195	280	280	162	206	99	173	142	117	5.0	50
26	27	152	242	254	242	173	638	121	195	82	4.5	35
27	27	152	305	717	230	292	717	102	128	69	5.0	33
28	31	132	242	758	173	677	932	92	92	55	5.0	45
29	32	132	254	495	-----	564	843	79	71	48	4.5	58
30	29	109	292	359	-----	495	677	71	84	39	4.0	39
31	27	-----	254	318	-----	432	----	62	-----	52	3.5	-----

Note.—No gage-height record Apr. 5, 1925; discharge interpolated.

Monthly Discharge of Middle Fork River at Midvale, for the year ending September 30, 1925.

Month.	Discharge second-feet.				Run-off in inches.
	Maximum	Minimum.	Mean.	Per square mile.	
1924-25					
October	932	27	106	0.869	1.00
November	230	22	75.7	0.620	0.69
December	717	106	283	2.32	2.68
January	1,170	142	437	3.58	4.13
February	1,220	162	401	3.29	3.43
March	2,150	173	409	3.35	3.86
April	932	95	324	2.66	2.97

May	1,120	62	323	2.65	3.06
June	432	36	141	1.16	1.29
July	638	29	120	0.984	1.13
August	61	3.5	147	1.20	1.38
September	152	2.5	32.6	0.267	0.30
The year	2,150	2.5	222	1.82	25.92

Extremes of Discharge (1926).—Maximum stage recorded, 9.87 feet at 5 p. m. October 25 (discharge, 4,170 second-feet); minimum stage, 1.27 feet at 7 a. m. August 11 and 12 (discharge, 7.0 second-feet).

The following discharge measurements were made during the year ending September 30, 1926:

Oct. 10, 1925: Gage height, 2.44 feet; discharge, 157 second-feet.
Apr. 10, 1926: Gage height, 4.05 feet; discharge, 600 second-feet.
June 27, 1926: Gage height, 1.88 feet; discharge, 63.8 second-feet.

Daily Discharge, in second-feet, of Middle Fork River at Midvale, for the year ending September 30, 1926.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1925				1926								
1	29	184	242		1020	280	529	332	184	27	52	69
2	26	195	206		495	292	402	218	206	24	31	68
3	55	195	242	145	529	184	359	195	152	22	24	162
4	76	195	230		463	218	320	195	142	20	14	119
5	758	173	230	1000	332	195	280	162	184	95	13	142
6	254	206	242	677	195	195	305	142	206	305	60	292
7	162	254	218	373	267	463	932	124	206	529	20	638
8	109	1020	206	332	242	1170	638	115	373	230	20	359
9	89	978	173	267	218	677	843	102	173	124	14	267
10	142	564	173	206	292	402	564	113	132	121	9.0	388
11	128	388	142	195	242	463	495	106	113	206	7.5	267
12	121	318	132	152	267	388	432	85	318	173	7.5	195
13	359	1020	117	130	345	318	373	79	495	117	162	132
14	332	978	102	142	1220	267	332	73	292	102	51	104
15	1430	758	92	132	1770	218	280	73	332	89	33	82
16	638	638	95	117	887	195	230	402	280	71	31	71
17	1540	600	82	142	529	162	195	373	218	50	78	58
18	978	463	71	600	564	184	195	305	173	45	932	53
19	495	402	71	1660	1430	280	173	345	128	37	1600	45
20	292	402	79	843	887	800	152	305	106	34	3050	41
21	242	345	71	638	1070	1020	242	242	82	26	1540	50
22	206	305	162	2700	638	717	292	206	87	22	529	52
23	152	254	152	978	1070	677	318	173	142	26	242	37
24	173	206	152	600	677	564	292	142	115	22	600	31
25	1770	173		402	600	463	292	132	82	106	1320	50
26	1320	162		305	564	402	280	132	71	31	717	564
27	638	173		142	432	332	230	195	65	23	402	280
28	402	345	145	195	318	305	373	173	50	18	242	218
29	280	318		206	-----	318	463	142	39	22	162	218
30	218	280		206	-----	529	388	121	31	22	117	206
31	195	-----		318	-----	564	----	173	-----	16	89	-----

Monthly Discharge of Middle Fork River at Midvale, for the year ending September 30, 1926.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1925-26					
October	1,770	26	439	3.60	4.15
November	1,020	162	416	3.41	3.80
December	242	71	152	1.25	1.44
January	2,700	117	459	3.76	4.34
February	1,770	195	627	5.14	5.35
March	1,170	162	427	3.50	4.04
April	932	152	373	3.06	3.41
May	402	73	183	1.50	1.73
June	495	31	173	1.42	1.58
July	529	16	88.9	0.729	0.84
August	3,050	7.5	393	3.22	3.71
September	638	31	175	1.43	1.60
The year	3,050	7.5	323	2.65	35.99

Extremes of Discharge (1927).—Maximum stage, 9.93 feet at 10:30 a. m. December 21 (discharge, 4,170 second-feet); minimum stage, 1.38 feet at 7 p. m. September 30 (discharge, 13 second-feet).

The following discharge measurement was made in 1927: March 23: Gage height, 3.94 feet; discharge, 560 second-feet.

Daily Discharge, in second-feet, of Middle Fork River at Midvale, for the year ending September 30, 1927.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1926				1927								
1	359	432	254	345	495	292	359	1540	142	57	432	50
2	305	388	242	254	402	242	495	800	117	49	402	42
3	887	318	218	254	292	173	529	495	142	45	292	35
4	495	267	195	373	184	173	887	495	184	36	463	33
5	318	206	218	463	564	124	800	463	254	25	267	29
6	242	173	529	373	2220	184	2220	388	184	18	162	24
7	184	142	432	305	1960	184	758	318	173	218	121	20
8	142	121	432	242	843	1020	495	267	152	206	162	19
9	117	206	432	280	529	978	1660	206	117	109	2280	20
10	106	242	1020	230	388	638	1540	184	102	76	978	40
11	85	206	843	132	242	402	800	184	102	55	432	1020
12	78	195	600	104	195	318	529	230	78	41	218	267
13	78	195	1120	184	242	360	402	267	93	29	142	173
14	142	195	978	267	267	402	373	305	638	26	124	104
15	89	195	638		359	345	292	1070	717	38	402	85

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
16	78	887	432	225	332	305	267	1710	345	35	206	73
17	600	800	373		318	267	184	2220	218	43	162	68
18	463	564	230		432	242	195	1320	195	37	152	55
19	305	432	206	495	2560	242	184	932	230	24	128	66
20	1220	345	267	3050	1380	638	173	677	218	20	292	68
21	978	292	3890	3050	758	677	152	463	152	14	758	45
22	564	242	2910	1770	529	758	717	677	109	31	402	39
23	388	195	1320	1540	1020	564	529	432	128	162	280	33
24	300	173	758	2020	978	402	463	359	128	95	184	30
25	564	173	932	932	600	318	318	267	95	52	132	26
26	564	162	2700	529	529	267	267	318	173	35	99	24
27	463	230	978	373	463	230	432	345	152	31	173	22
28	373	206	677	305	345	184	529	292	99	26	72	19
29	332	206	717	432	-----	152	463	242	84	24	90	17
30	332	267	529	564	-----	152	2350	184	65	39	82	14
31	373	-----	432	638	-----	132	----	162	-----	113	62	-----

Monthly Discharge of Middle Fork River at Midvale, for the year ending September 30, 1927.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1926-27					
October	1,220	78	372	3.05	3.52
November	887	121	288	2.36	2.63
December	3,890	195	823	6.75	7.78
January	3,050	104	658	5.39	6.21
February	2,560	184	694	5.69	5.92
March	1,020	124	367	3.01	3.47
April	2,350	152	645	5.29	5.90
May	2,220	162	575	4.71	5.43
June	717	65	186	1.52	1.70
July	218	14	58.4	0.479	0.55
August	2,280	62	327	2.68	3.09
September	1,020	14	85.3	0.699	0.78
The year	3,890	14	422	3.46	46.98

Extremes of Discharge (1928).—Maximum stage probably about 14.3 feet at 7 a. m. June 20 (discharge, about 7,250 second-feet); minimum stage, 1.30 feet at 8 a. m. October 1 (discharge, 9 second-feet).

The following discharge measurement was made in 1928:
Sept. 17: Gage height, 1.53 feet; discharge, 27.9 second-feet.

Stage-discharge relation affected by ice December 21-24, January 2-7, 28-31, February 1-3; gage height reading in error July 16, August 17, September 21,22. Discharge averaged from 2 twelve-hour periods Oct. 19, Dec. 3, 12, Apr. 11, 23. No readings Apr. 8, 9, June 19, 20, Sept. 18, 23.

Daily Discharge, in second-feet, of Middle Fork River at Midvale, for the year ending September 30, 1928.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1927				1928								
1	11	58	254	495		218	280	3000	242	677	84	267
2	15	60	230		120	173	292	1220	230	463	142	195
3	16	230	566			162	280	677	267	359	130	184
4	21	402	529	160	152	184	242	463	254	206	102	152
5	31	388	402		682	195	230	332	800	218	95	109
6	22	345	318		843	132	195	267	887	184	71	109
7	13	292	267		564	173	184	218	717	162	68	102
8	24	280	267	318	529	184	220	184	800	152	60	79
9	36	1710	195	242	932	230	170	162	495	128	50	68
10	36	1120	162	195	677	142	162	132	1220	402	44	59
11	28	600	184	162	495	388	732	128	758	206	42	53
12	22	432	682	173	373	292	1270	242	463	152	66	44
13	124	292	1660	152	318	254	677	195	318	111	58	39
14	60	242	1840	132	318	280	495	173	242	1020	48	38
15	44	195	1020	124	495	230	345	162	218	373	37	34
16	38	184	677	109	432	292	267	152	162	242	33	33
17	34	218	463	113	345	529	230	162	173	173	51	28
18	44	600	359	162	332	529	206	267	173	119	152	26
19	877	463	280	318	206	388	184	218	4400	92	152	24
20	2980	332	206	1120	254	318	162	677	5500	73	109	240
21	1170	564		564	206	292	152	495	1430	373	79	280
22	432	305	125	373	195	388	162	359	2020	173	73	140
23	305	432		332	267	1120	454	267	1170	254	65	90
24	206	1120		254	717	1170	1430	206	1170	152	59	68
25	142	800	104	564	600	800	1070	254	887	109	117	49
26	117	529	106	402	402	495	677	529	564	99	106	43
27	93	388	128	332	495	432	529	495	677	85	463	48
28	84	292	132		267	318	529	495	402	195	758	35
29	72	242	242	160	218	280	490	359	345	132	318	31
30	71	195	402		-----	292	4000	292	1120	84	195	53
31	65	-----	402		-----	292	----	305	-----	69	102	-----

Monthly Discharge of Middle Fork River at Midvale, for the year ending September 30, 1928.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1927-28					
October	2,980	11	234	1.92	2.21
November	1,710	58	444	3.64	4.06
December	1,840	----	406	3.33	3.84
January	1,120	109	266	2.18	2.51
February	932	----	403	3.30	3.56

March	1,170	132	360	2.95	3.40
April	4,000	152	544	4.46	4.98
May	3,000	128	422	3.46	3.99
June	5,500	162	937	7.68	8.57
July	1,020	69	233	1.91	2.20
August	758	33	127	1.04	1.20
September	280	24	90.7	0.743	0.83
The year	5,500	11	371	3.04	41.35

Tygart River Near Dailey.

Location.—At Burnt Bridge, on Staunton-Parkersburg Pike, 1 mile northeast of Dailey, Randolph County, 2 miles south of Beverly, on the Western Maryland Railroad. Stalnaker Run enters river on right about 1,000 feet below station and above the control.

Drainage Area.—194 square miles (measured on topographic maps).

Records Available.—April 20, 1915 to September 30, 1928.

Gage.—Vertical staff on face of right abutment of bridge near downstream end; read twice daily, to hundredths, by Charles W. Chenoweth, 1915-18; by Charles W. and Mary Chenoweth, 1919-20; by Mary Chenoweth and H. W. McQuain, 1921; by Mary Chenoweth, 1922; by Mrs. M. B. Chenoweth, 1923; by Mrs. Rowena McQuain and Mrs. M. B. Chenoweth, 1924; by Mrs. M. B. Chenoweth, 1925-27; by Mrs. R. McQuain and Mrs. M. B. Chenoweth, 1928.

Discharge Measurements.—Made from bridge or by wading. Stay wire is used for measurements at high stages. Flow of Stalnaker Run is included.

Channel and Control.—One channel at all stages, straight for 100 feet above and 1,300 feet below bridge. Right bank high and clean; left bank low; large overflow through meadows at high stages. Stream bed is rocky but banks are sandy. Control probably permanent. Point of zero flow, gage height 0.2 foot ± 0.2 foot.

Extremes of Stage (1915).—Maximum stage recorded, 8.6 feet at 7:30 a. m. June 14; minimum stage recorded, 0.85 foot at 7 a. m. and 7 p. m. September 17 and at 7:30 a. m. and 7:30 p. m. September 18. Highest known flood reached a stage represented approximately by gage height 16 feet.

Regulation.—None.

Accuracy.—Records good.

Cooperation.—Station maintained in cooperation with United States Engineer Corps.

Discharge Measurements of Tygart River near Dailey, during the year ending September 30, 1915.

Date	Made by—	Gage height.	Discharge.
		Feet.	Sec.-ft.
Apr. 19	J. E. Stewart	1.74	135
Sept. 16	B. J. Peterson	0.90	17.7

Daily Discharge, in second-feet, of Tygart River near Dailey, for the year ending September 30, 1915.

Day	Apr.	May	June	July	Aug.	Sept.
1915						
1	--------	475	595	39	59	62
2	--------	320	367	47	34	71
3	--------	191	419	49	30	77
4	--------	204	555	39	37	93
5	--------	167	419	46	35	87
6	--------	145	274	93	30	82
7	--------	116	204	54	26	54
8	--------	116	167	39	22	49
9	--------	100	135	52	20	59
10	--------	87	104	56	35	66
11	--------	71	87	52	22	71
12	--------	77	80	44	35	90
13	--------	116	90	33	125	26
14	--------	97	2690	26	107	20
15	--------	84	2560	52	245	19
16	--------	72	857	28	167	20
17	--------	62	456	42	320	16
18	--------	56	304	107	245	16
19	--------	52	217	66	156	304
20	114	52	156	56	82	245
21	109	68	135	191	98	274
22	100	135	125	167	74	274
23	145	260	97	116	98	179
24	191	245	71	82	77	104
25	179	191	59	58	71	80
26	156	145	49	44	77	62
27	125	145	44	49	93	58
28	903	116	35	37	62	59
29	1670	107	31	30	58	49
30	811	1050	31	33	98	42
31	--------	1560	------	82	87	------

Monthly Discharge of Tygart River near Dailey, for the year ending September 30, 1915.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum	Minimum.	Mean.	Per square mile.	
1915					
April 20-30	1,670	100	409	2.06	0.84
May	1,560	52	216	1.11	1.28
June	2,690	31	380	1.96	2.19
July	191	26	61.6	0 318	0.37
August	320	20	87.9	0.453	0.52
September	304	16	90.3	0.465	0.52

Extremes of Stage (1916).—Maximum recorded during year, 10.3 feet at 5 p. m., December 18; minimum stage, 0.6 foot at 7 a m., December 4.

Accuracy.—Stage-discharge relation probably permanent; affected by ice during December, January, and February. Rating curve not yet developed. Gage read twice daily to half tenths.

Discharge Measurements of Tygart River near Dailey, during the year ending September 30, 1916.

The following discharge measurements were made by J. E. Stewart and L. Lee, respectively:
March 24, 1916: Gage height, 3.80 feet; discharge, 886 second-feet.
Sept. 16, 1916: Gage height, 3.20 feet; discharge, 580 second-feet.

Daily Discharge, in second-feet, of Tygart River near Dailey, for the year ending September 30, 1916.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1915				1916								
1	1620	37		595	1240	260	456	401	260	98	56	22
2	1090	35		2970	1050	367	320	475	204	66	49	19
3	515	44	140	1090	679	401	367	475	320	1400	40	19
4	304	40		595	437	384	367	437	274	437	35	26
5	204	35	98	419	384	351	274	351	217	217	179	25
6	167	35	107	679	367	515	245	274	204	145	274	20
7	125	71	90		1050	2690	217	274	167	107	231	18
8	104	62	74		857	2560	217	304	167	77	93	25
9	87	54	90	410	637	950	217	274	167	68	191	30
10	77	44	87		595	637	204	245	167	66	145	49
11	71	37	74	2970	475	437	217	204	156	49	167	49
12	59	35	107	2760	857	351	555	167	145	56	419	37
13	49	44	107	1340	2830	351	595	145	107	71	320	25
14	46	77			1140	1340	475	167	87	179	231	15
15	45	1240	70			2490	475	125	125	204	167	2300
16	30	1140				950	401	274	167	116	145	637
17	35	401	950	350	290	679	351	335	156	90	231	384
18	30	304	4320			437	595	289	145	107	145	135
19	1450	304	2100			384	437	204	125	93	93	98
20	595	637	723			274	335	167	145	74	87	77
21	367	637	475			274	245	125	167	77	74	66
22	320		320	767	401	2160	260	167	204	437	66	77
23	304		274	857	384	1970	260	145	167	167	74	62
24	260		217	637	367	950	217	135	145	145	66	46
25	217		217	437	475	595	857	125	555	98	46	40
		210										
26	217		437	335		437	1240		637	93	35	33
27	167		367	274		401	1090		231	82	35	26
28	125		515	245	300	679	950	520	191	274	44	26
29	87		1910	304		857	679		156	115	37	1050
30	66		1790	1400	-----	679	437		116	87	26	679
31	49	-----	857	950	-----	555	----		-----	59	25	-----

Monthly Discharge of Tygart River near Dailey, for the year ending September 30, 1916.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1915-16					
October	1,620	30	287	1.48	1.71
November	1,240	35	240	1.24	1.38
December	4,320	----	551	2.84	3.27
January	2,970	----	776	4.00	4.61
February	2,830	----	602	3.10	3.34
March	2,690	260	850	4.38	5.05
April	1,240	204	452	2.33	2.60
May	----	125	303	1.56	1.80
June	637	87	202	1.04	1.16
July	1,400	49	173	0.892	1.03
August	419	25	123	0.634	0.73
September	2,300	15	204	1.05	1.17
The year	4,320	15	397	2.05	27.85

Extremes of Stage (1917).—Maximum stage recorded during year, 13.4 feet at 7 a. m., March 12; minimum stage, 0.6 foot at 7 a. m., September 6.

Discharge Measurements of Tygart River near Dailey, during the year ending September 30, 1917.

Date	Made by—	Gage height. Feet.	Discharge. Sec.-ft.
Apr. 6	B. E. Jones	3.47	702
Apr. 8	B. E. Jones	4.42	1,120
Sept. 26	Peterson and Hopkins	0.75	10.2

Daily Discharge, in second-feet, of Tygart River near Dailey, for the year ending September 30, 1917.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1916				1917								
1	289	59	107	401	637	1340	191	351	437	191	44	7
2	191	59	104	320		857	191	274	456	84	35	7
3	125	51	90	437		1910	179	217	437	65	32	7
4	98	42	84	857		2620	145	191	335	56	31	7
5	82	39	100	1090		1970	156	191	260	44	30	7
6	62	35	125	3180		1050	401	145	217	35	28	30
7	56	35	104	1140		857	679	135	179	30	26	30
8	49	33	100	767		3320	1560	145	145	25	29	107
9	59	31	105	437		1620	767	419	125	23	30	304
10	104	39	104	335		950	595	515	191	22	23	116

PLATE LXIII.—Close view of tree trunk in Elkins Sandstone of Chemung at Fossil Lot 388 in cut of Valley River Railroad east of Tygart River and one-third mile north of Spangler. This tree is nearly 3 feet in diameter.
(Photo. by E. E. Harris.)

PLATE LXIV.—Slab of a tree trunk in Elkins Sandstone of Chemung at Fossil Lot 388 in cut of Valley River Railroad east of Tygart River and one-third mile north of Spangler. Two-foot rule shows present size of slab but full size of tree is unknown.
(Photo. by E. E. Harris.)

PLATE LXV.—Partial view of Valley Head Sandstone of Chemung at type locality just northeast of Valley Head village, showing tree trunks bedded in strata at Fossil Lot 374. (Photo. by E. E. Harris.)

PLATE LXVI.—Close view of flattened cross-section of tree in Valley Head Sandstone of Chemung at Fossil Lot 374 just northeast of Valley Head. This trunk, which measured 4 feet by 12½ inches, has now been destroyed by road workers. (Photo. by E. E. Harris.)

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
					210							
11	77	37	93	260		1730	679	410	204	19	20	72
12	62	35		217		7190	857	335	145	19	17	44
13	52	33		245		3180	679	274	107	19	16	30
14	49	35		437		4470	475	217	97	19	16	24
15	46	33				1290	367	217	90	19	16	19
			55									
16	46	26				950	260	167	80	26	15	18
17	74	26				903	204	145	71	37	15	15
18	245	26		270		950	191	135	58	98	12	14
19	204	26				637	167	125	51	156	10	12
20	335	26			1790	595	156	116	54	82	9	12
21	456	26	145		1240	811	135	116	49	63	8	12
22	274	26	1620	5300	679	1850	125	102	39	74	8	20
23	167	28	998	1500	515	950	116	93	33	217	7	22
24	135	204	456	723	4170	1450	107	87	59	204	9	14
25	107	274	335	456	1450	1140	107	74	30	475	11	13
26	93	145	260	320	811	637	107	68	28	274	12	12
27	92	135	437	135	1140	437	104	3600	26	179	10	12
28	92	145	2690	245	1670	367	105	3390	33	116	8	12
29	92	125	1790	245	-----	320	437	4170	191	100	8	13
30	58	107	903	401	-----	260	401	1560	274	77	8	14
31	54	-----	456	367	-----	217	----	723	-----	65	7	-----

Monthly Discharge of Tygart River near Dailey, for the year ending September 30, 1917.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1916-17					
October	456	46	127	0.655	0.76
November	274	26	64.7	0.334	0.37
December	2,690	--	377	1.94	2.24
January	5,300	--	700	3.61	4.16
February	4,170	--	639	3.29	3.43
March	7,190	217	1,510	7.78	8.97
April	1,560	104	355	1.83	2.04
May	4,170	68	603	3.11	3.58
June	456	26	150	0.773	0.86
July	475	19	94.1	0.485	0.56
August	44	7	17.7	0.091	0.10
September	304	7	34.2	0.176	0.20
The year	7,190	7	390	2.01	27.27

Extremes of Stage (1918).—Maximum stage recorded during year, 15.9 feet at 5 p. m., March 13; minimum stage recorded, 0.68 foot October 7, 8, and 9.

Discharge Measurement of Tygart River near Dailey, during the year ending September 30, 1918.

The following discharge measurement was made by B. L. Hopkins:

May 3, 1918: Gage height, 2.10 feet; discharge, 216 second-feet.

Daily Discharge, in second-feet, of Tygart River near Dailey, for the year ending September 30, 1918.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1917				1918								
1	14	289	384		401	515	125	304	156	767	35	179
2	13	145	274		304	475	125	260	125	367	19	82
3	12	104	204		274	367	191	217	107	304	18	62
4	11	80	191		245	274	245	191	93	167	18	42
5	10	70	145		220	456	400	167	77	125	16	26
6	10	59	125		200	637	230	145	59	107	15	51
7	9	50	104		679	1790	200	204	167	87	16	33
8	9	50	88		950	1340	260	3460	179	62	33	52
9	9	51	82		1970	767	1850	1670	90	56	26	44
10	10	35			3180	595	1140	679	74	107	44	33
11	10	31			1240	555	767	475	56	125	102	28
12	11	30			1140	475	679	351	40	62	145	23
13	12	30			1290	6870	367	811	37	36	191	24
14	14	30			950	5600	555	3110	33	26	289	104
15	16	27		240	1340	3390	1910	1050	25	26	179	68
16	14	25	40		950	1500	1340	595	22	35	107	43
17	13	23			595	767	950	515	145	35	77	71
18	12	20			320	475	595	320	320	35	145	351
19	12	20			335	401	401	204	191	167	437	456
20	93	20			3180	351	367	217	104	98	179	245
21	97	19			2040	320	475	231	77	66	102	401
22	59	20			723	245	595	191	90	44	71	335
23	39	24			555	437	475	811	71	25	51	179
24	39				419	351	515	767	56	22	40	125
25	68	20	560		1090	351	857	1970	76	19	31	104
26	87		767		4540	320	767	4020	637	30	27	74
27	145		515		1560	274	679	1050	231	33	22	65
28	304		401		723	245	555	767	145	19	19	51
29	156	231		3530	-----	204	419	515	3950	18	18	44
30	245	274	210	1140	-----	191	335	320	1490	18	18	37
31	304	-----		637	-----	191	-----	231	-----	56	217	-----

Monthly Discharge of Tygart River near Dailey, for the year ending September 30, 1918.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1917-18					
October	304	9	59.9	0.309	0.36
November	289	----	61.9	0.319	0.36
December	767	----	164	0.845	0.97
January	3,530	----	388	2.00	2.31
February	4,540	200	1,120	5.77	6.01
March	6,870	191	991	5.11	5.89
April	1,910	125	612	3.15	3.51
May	4,020	145	833	4.29	4.95
June	3,950	22	294	1.52	1.70
July	767	18	101	0.521	0.60
August	437	15	87.3	0.450	0.52
September	456	23	114	0.588	0.66
The year	6,870	9	398	2.05	27.84

Extremes of Stage (1919).— Maximum stage recorded during the year, 12.1 feet at 4:30 p. m. January 1; minimum stage, 0.68 foot September 21.

Discharge Measurements of Tygart River near Dailey, during the year ending September 30, 1919.

Note.—No discharge measurements were made during year ending September 30, 1919.

Daily Discharge, in second-feet, of Tygart River near Dailey, for the year ending September 30, 1919.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1918				1919								
1	30	723	289	5300	135	767	260	156	93	84	80	58
2	27	401	245	5750	90	515	217	401	116	62	145	44
3	24	245	217	1730	90	367	191	351	100	45	107	35
4	21	217	179	950	116	274	179	274	74	35	64	28
5	20	179	145		116	217	167	231	59	30	56	26
6	20	145	125		104	811	167	179	59	26	87	20
7	20	116	116		93	595	145	167	56	26	85	18
8	20	100	217	330	84	456	135	231	59	22	77	16
9	18	90	401			475	125	679	54	20	74	16
10	18	77	2420		60	595	116	2970	44	19	56	15
11	18	68	1910			437	145	1240	35	107	35	16
12	26	62	1400	260		335	555	679	59	56	26	40
13	54	58	811	274		274	401	456	60	135	26	42
14	54	46	456	274	92	217	289	351	56	245	26	23
15	39	45	2040	289	145	191	245	304	125	274	26	21

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
16	30	43	903	289	107	167	217	260	156	3250	26	18
17	25	39	555	367	92	156	437	401	93	1400	26	14
18	22	60	367	1050	107	191	384	637	125	335	77	12
19	22	191	274	1400	90	274	320	475	66	335	98	11
20	20	351	191	679	74	245	274	320	49	1050	59	10
21	26	555	179	456	217	217	231	437	46	723	51	9
22	47	351	204	367	260	167	191	555	37	437	156	11
23	56	274	1090	351	367	167	156	637	25	857	156	125
24	46	179	950	1620	555	145	217	475	26	304	90	145
25	49	145	723	767	475	125	245	679	87	167	58	84
26	260	125	637	555	950	116	217	637	475	116	49	54
27	156	104	419	384	637	167	179	419	679	77	45	35
28	125	135	320	274	475	1090	156	304	437	66	42	30
29	104	679	274	217	-----	595	156	191	231	55	39	25
30	767	401	217	191	-----	437	145	125	125	45	35	20
31	1790	-----	320	167	-----	320	----	97	-----	36	30	-----

Monthly Discharge of Tygart River near Dailey, for the year ending September 30, 1919.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1918-19					
October	1,790	18	128	0.660	0.76
November	723	39	207	1.07	1.19
December	2,420	116	600	3.09	3.56
January	5,750	167	847	4.37	5.04
February	950	----	206	1.06	1.10
March	1,090	116	358	1.85	2.13
April	555	116	229	1.18	1.32
May	2,970	97	494	2.55	2.94
June	679	25	124	0.639	0.71
July	3,250	19	337	1.74	2.01
August	156	26	64.7	0.334	0.39
September	145	9	34.0	0.175	0.20
The year	5.750	9	305	1 57	21.35

Extremes of Stage (1920).—Maximum stage recorded during year, 12.04 feet at 5 p. m., December 7; minimum stage, 0.65 foot at 8 a. m., September 27.

Discharge Measurements of Tygart River near Dailey, during the year ending September 30, 1920.

Date.	Made by—	Gage height. Feet.	Discharge. Sec.-Ft.
May 17	Peterson and Bigwood	2.55	384
June 21	B. L. Bigwood	1.30	57

Daily Discharge, in second-feet, of Tygart River near Dailey, for the year ending September 30, 1920.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1919				1920								
1	16	217	245		167	195	135	1670	97	23	46	43
2	16	2970	191		156	195	135	723	77	23	145	31
3	15	1050	167		135	195	274	335	62	125	52	26
4	14	515	135		384	195	274	304	54	950	30	25
5	14	304	125	250	555	1090	384	231	274	515	26	22
6	20	217	125		367	998	456	191	274	167	71	20
7	62	167	5300		190	515	679	167	191	107	125	20
8	54	145	2230	1910	190	367	679	145	125	100	68	20
9	28	116	1050	3390	190	304	679	125	105	65	44	19
10	25	95	903	1400	595	260	595	107	85	49	44	28
11	22	87	723	767	950	245	515	93	70	54	179	35
12	191	87	515	555	595	637	437	145	60	217	167	40
13	515	77	437	401	401	2970	515	2040	56	135	167	44
14	335	65	2830	274	304	1560	401	1850	56	98	93	28
15	998	54	1090			857	304	811	59	80	80	22
16	637	54	595			1190	274	475	68	125	125	18
17	475	50		220	220	2300	304	260	92	82	116	16
18	401	46				998	335	260	84	59	135	15
19	245	44				2830	289	245	60	93	437	14
20	191	37				3250	437	231	49	87	637	13
21	167	36		1450	204	1190	3880	231	70	65	555	12
22	245	49		3180	1910	811	1500	260	77	46	555	10
23	637	72		4540	1730	637	811	260	71	33	595	9
24	998	65	250	3110	1340	475	515	260	59	76	351	8
25	637	66		1910	857	384	351	384	49	767	217	8
26	367	2300		857	555	304	304	515	42	384	156	8
27	260	1620		555	335	260	304	320	29	289	116	8
28	204	767		401	290	217	274	204	26	167	93	10
29	167	456		289	290	191	245	167	25	92	74	92
30	135	351		245	-----	167	231	145	24	68	59	59
31	104	-----		204	-----	135	----	116	-----	54	51	-----

Monthly Discharge of Tygart River near Dailey, for the year ending September 30, 1920.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1919-20					
October	998	14	264	1.36	1.57
November	2,970	36	406	2.09	2.33
December	5,300	125	658	3.39	3.91
January	4,540	204	920	4.74	5.46
February	1,910	135	483	2.49	2.68
March	3,250	135	836	4.31	4.97

April	3,880	135	551	2.84	3.17
May	2,040	93	428	2.21	2.55
June	274	24	82.3	0.424	0.47
July	950	23	168	0.866	1.00
August	637	26	181	0.933	1.08
September	92	8	24.1	0.124	0.14
The year	5,300	8	418	2.15	29.33

Extremes of Discharge (1921).—Maximum stage recorded during year, 11.0 feet at 7:30 a. m., May 30 (discharge, 5,600 second-feet); minimum stage, 0.74 foot, at 5:30 a. m., October 24 (discharge, 12 second-feet).

Discharge Measurements of Tygart River near Dailey, during the year ending September 30, 1921.

Date	Made by—	Gage height. Feet.	Discharge. Sec.-ft.
Nov. 19	Bigwood and Lamoureux	2.05	208
May 11	Bigwood and Lamoureux	2.08	229

Daily Discharge, in second-feet, of Tygart River near Dailey, for the year ending September 30, 1921.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1920				1921								
1	68	33	767	145	245	637	204	245	767	104	24	14
2	217	31	637	167	217	595	204	217	401	66	30	14
3	125	135	456	167	191	2040	204	320	260	50	595	14
4	80	116	384	167	167	1450	191	2560	167	35	401	125
5	104	74	767	156	145	723	167	1970	135	22	125	179
6	71	60	723	145	191	475	145	1050	100	19	59	125
7	52	44	515	125	179	351	125	637	77	18	56	167
8	42	36	304	204	217	289	167	437	66	18	54	80
9	33	60	217	475	595	245	191	320	62	35	46	62
10	28	116	231	335	1050	351	245	274	59	145	38	60
11	25	125	191	260	723	260	217	217	56	87	28	55
12	22	116	156	204	515	217	179	231	62	135	19	59
13	19	87	135	156	367	191	167	217	49	320	27	46
14	18	60	595	274	335	191	145	179	40	515	66	35
15	16	49	857	679	335	456	125	135	35	260	595	25
16	14	66	515	384	304	384	125	107	35	125	179	25
17	13	245	351	320	245	335	116	95	29	87	125	22
18	14	289	274	260	217	304	125	84	80	68	107	19
19	14	245	167	217	170	274	107	76	217	62	104	18
20	13	335	100	191		217	100	68	93	56	74	17
21	13	679	100	191		179	105	58	65	51	56	20
22	12	637	100	260		191	93	52	55	42	44	66
23	12	723	2040	515	120	167	90	46	71	26	35	51
24	12	401	903	679		167	88	47	74	22	30	34
25	13	304	515	595		179	84	135	66	16	24	31

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
26	22	274	367	437		167	74	595	245	14	22	26
27	22	217	274	274		145	98	245	107	14	18	28
28	135	367	231	167	679	145	191	135	107	14	16	35
29	84	767	217	156	-----	145	304	179	156	14	14	32
30	58	437	179	167	-----	116	274	4840	145	16	14	30
31	35	-----	156	274	-----	135	----	1290	-----	22	14	-----

Note.—Stage-discharge relation affected by ice Dec. 14-17, 1915; Jan. 7-10, 14-21, Feb. 15-21, 26-29, Dec. 12-20, 1916; Jan. 15-21, Feb. 2-19, Nov. 24-28, Dec. 10-25, 29-31, 1917; Jan. 1-28, Feb. 5-6, 1918; Jan. 5-11, Feb. 9-13, Dec. 17-31, 1919; Jan. 1-7, 15-20, Feb. 7-9, 15-20, 28-29, Mar. 1-4, Dec. 20-22, 1920; and Feb. 19-27, 1921. Gage heights probably in error Nov. 22 to Dec. 4, 1915; May 26-31, 1916; Sept. 22, Nov. 8, 1917; and Apr. 5-7, 1918. Discharge for these periods estimated from observer's notes, study of weather records, and comparison with records of discharge at other stations in the Tygart River basin.

Monthly Discharge of Tygart River near Dailey, for the year ending September 30, 1921.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1920-21					
October	217	12	45.4	0.234	0.27
November	767	31	238	1.23	1.37
December	2,040	----	433	2.23	2.57
January	679	125	282	1.45	1.67
February	1,050	----	287	1.48	1.54
March	2,040	116	378	1.95	2.25
April	304	74	155	0.799	0.89
May	4,840	46	550	2.84	3.27
June	767	29	129	0.665	0.74
July	515	14	79.9	0.412	0.43
August	595	14	98.0	0.505	0.58
September	179	14	50.5	0.260	0.29
The year	4,840	12	228	1.18	15.92

Extremes of Discharge (1922).—Maximum stage recorded during year, 10.5 feet at 5 p. m., December 18 and 8 a. m. December 24 (discharge, 5,220 second-feet); minimum stage, 0.65 foot on September 30 (discharge, 8 second-feet).

Discharge Measurements of Tygart River near Dailey, during the year ending September 30, 1922.

Date	Made by—	Gage height. Feet.	Discharge. Sec.-ft.
Jan. 31	J. J. Dirzulaitis	1.73	126
Feb. 20	Dirzulaitis and Bigwood	8.76	3,910
Feb. 20	Dirzulaitis and Bigwood	9.35	4,360

Daily Discharge, in second-feet, of Tygart River near Dailey, for the year ending September 30, 1922.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1921				1922								
1	42	2360	595	167	107	351	1050	191	125	107	116	59
2	35	767	637	107	145	2690	857	167	107	93	90	68
3	68	456	723	125	156	1500	555	156	116	107	88	80
4	304	274	637	191	107	857	384	998	125	555	167	76
5	260	191	475	595	107	723	289	1670	401	595	100	145
6	204	135	401	595	100	723	217	2360	304	274	68	93
7	145	104	351	419	100	679	156	950	217	167	84	71
8	93	71	515	335	80	903	145	515	515	125	555	54
9	92	79	679	384	80	637	135	351	401	217	351	46
10	71	156	857	335	116	767	125	289	245	125	191	40
11	58	145	384	351	3740	1140	116	231	231	87	135	36
12	46	167	384		1730	811	135	191	1970	70	97	56
13	42	145	456		1970	595	116	167	903	62	71	65
14	38	145	419		1560	475	679	903	419	145	60	44
15	35	245	367	230	767	1140	4100	401	260	135	65	34
16	31	231	335			1560	1290	260	204	135	62	28
17	26	2040	555		360	811	637	191	679	104	102	24
18	19	1450	4540	304		475	475	191	2040	125	68	19
19	19	903	1340	2360		351	419	515	723	245	47	16
20	19	1240	679	3040	3950	320	384	304	950	145	42	16
21	30	767	515	1450	2830	274	320	320	679	100	37	16
22	35	679	401	1290	1290	245	475	217	384	68	35	15
23	36	637	2970	950	679	217	401	167	245	54	30	14
24	30	903	4700	401	515	595	335	135	167	857	44	13
25	26	2620	2900		351	679	289	107	125	475	367	12
26	26	637	1090	250	289	475	274	595	98	245	304	12
27	24	1050	679		320	367	245	1050	87	191	191	11
28	22	1240	437		384	437	260	595	107	125	116	10
29	20	1790	351	167	-----	401	245	335	595	167	87	10
30	20	1050	245	125	-----	351	217	217	156	125	72	8
31	22	-----	217	107	-----	515	----	167	-----	125	65	-----

Note.—Stage-discharge relation affected by ice Jan. 12-17, 25-28, Feb. 8, 9, and 16-19; discharge estimated from study of weather records, observer's notes, one discharge measurement, and comparison with records for other stations on Tygart River.

Monthly Discharge of Tygart River near Dailey, for the year ending September 30, 1922.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1921-22.					
October	304	19	62.5	0.322	0.37
November	2,620	71	756	3.90	4.35
December	4,700	217	962	4.96	5.72
January	3,040	107	522	2.69	3.10
February	3,950	----	818	4.22	4.39
March	2,690	217	712	3.67	4.23
April	4,100	116	511	2.63	2.93
May	2,360	107	481	2.48	2.86
June	2,040	87	453	2.34	2.61
July	857	54	198	1.02	1.18
August	555	30	126	0.649	0.75
September	145	8	39.7	0.205	0.23
The year	4,700	8	468	2.41	32.72

Extremes of Discharge (1923).—Maximum stage recorded during year, 11.7 feet at 8 a. m., on February 2 (discharge, 6,150 second-feet); minimum stage, 0.58 foot October 6-8 (discharge, 4.2 second-feet).

Discharge Measurement of Tygart River near Dailey, during the year ending September 30, 1923.

The following discharge measurement was made by Dirzulaitis and Wallace:
April 2, 1923: Gage height, 1.70 feet; discharge, 123 second-feet.

Daily Discharge, in second-feet, of Tygart River near Dailey, for the year ending September 30, 1923.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1922				1923								
1	5.6	7.2	10	515	3950	595	124	144	47	144	1560	18
2	5.2	6.5	10	811	5140	475	120	118	43	105	723	15
3	4.9	5.6	20	475	1970	437	96	105	36	81	679	13
4	4.9	4.6	24	367	1240	456	109	100	31	68	998	16
5	4.6	4.6	767	244	857	437	166	96	29	56	1050	89
6	4.2	5.2	475	216	437	679	595	89	35	47	950	74
7	4.2	6.2	230	190	351	2230	351	81	68	55	456	47
8	4.2	5.9	1400	244	274	1140	335	74	107	81	289	419
9	4.9	5.9	637	335	230	767	259	124	91	55	244	259
10	6.5	5.9	515	401	216	595	203	178	52	41	216	144
11	10	5.9	289	437	203	998	155	335	320	34	1790	81
12	17	5.9	244	335	166	950	134	437	1190	71	1290	61
13	18	5.9	259	230	2620	903	178	456	3180	74	1850	52
14	15	5.9	216	190	1400	767	903	515	2490	47	595	36
15	11	5.9	320	1140	723	437	811	437	811	36	289	32

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
16	10	11	259	723		515	595	419	595	33	216	26
17	9.7	24	1340	440		903	456	384	320	25	155	22
18	7.8	24	1340	440		767	304	320	216	21	134	20
19	7.2	29	1090	244		515	230	259	166	16	101	26
20	6.5	52	401	335		419	190	203	134	13	84	24
21	6.5	33	230	723	150	351	166	190	103	12	63	351
22	6.5	25	178	1340		304	134	155	79	30	50	384
23	6.5	20	144	767		679	120	134	65	47	47	166
24	11	16	124	595		2100	103	122	63	36	43	105
25	9.6	12	116	595		767	91	105	1620	1620	36	77
26	18	12	92	367		555	87	94	401	259	34	57
27	13	12	77	767	351	384	74	85	456	114	27	45
28	11	12	81	2970	857	274	81	81	259	857	26	36
29	10	13	107	2360	-----	203	216	70	289	1090	24	34
30	9.7	12	105	1090	-----	178	190	60	216	637	22	26
31	7.8	-----	100	1050	-----	144	----	52	-----	2560	19	-----

Note.—Stage-discharge relation affected by ice Jan. 17, 18, and Feb. 16-26; discharge estimated by study of weather records and observer's notes.

Monthly Discharge of Tygart River near Dailey, for the year ending September 30, 1923.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1922-23					
October	18	4.2	8.74	0.045	0.05
November	52	4.6	13.1	0.068	0.08
December	1,400	10	361	1.86	2.14
January	2,970	190	675	3.48	4.01
February	5,140	----	808	4.16	4.33
March	2,230	144	675	3.48	4.01
April	903	74	253	1.30	1.45
May	515	52	194	1.00	1.15
June	3,180	29	450	2.32	2.59
July	2,560	12	270	1.39	1.60
August	1,850	19	454	2.34	2.70
September	419	13	91.8	0.473	0.53
The year	5,140	4.2	352	1.81	24.64

Extremes of Discharge (1924).—Maximum stage recorded during year, 11.9 feet at 8 a. m., on May 12 (discharge, 6,310 second-feet); minimum stage, 0.60 foot from 7:30 a. m. October 19 to 7:30 a. m. October 20 (discharge, 4.5 second-feet).

Discharge Measurement of Tygart River near Dailey, during the year ending September 30, 1924.

The following discharge measurement was made by Wiggins and Mussey:

June 23, 1924: Gage height, 1.36 feet; discharge, 69.7 second-feet.

Daily Discharge, in second-feet, of Tygart River near Dailey, for the year ending September 30, 1924.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1923				1924								
1	24	25	304	3040	289	274	723	1790	515	116	274	34
2	20	22	230	1050	259	437	515	857	419	87	203	35
3	18	22	190	3810	244	401	437	555	320	71	118	113
4	16.5	51	166	2970	216	367	595	475	274	67	81	79
5	14.5	98	274	1050	274	767	515	475	203	67	57	60
6	13.5	144	437	515	637	1090	595	401	166	91	45	48
7	12	335	437	330	437	767	1340	401	144	101	36	35
8	12	203	384	225	304	475	1050	419	144	475	36	28
9	10.5	120	274	150	274	335	767	3740	2560	304	35	190
10	9.5	84	950	244	244	304	595	1290	2620	178	20	767
11	9.5	70	1140	1620	144	274	475	811	811	134	20	456
12	9	68	767	1340	125	244	335	6230	515	94	25	259
13	9.5	65	515	679	120	190	274	5220	723	1140	107	134
14	8	60	595	456	110	178	230	1670	637	811	51	98
15	8	53	289	289	110	166	216	1670	351	384	34	76
16	7	50	335	555	120	144	190	998	274	244	26	58
17	6	87	244	2970	178	230	166	637	274	155	31	47
18	5	144	216	767	1910	515	178	903	178	124	31	53
19	4.5	134	166	515	1790	637	515	384	134	91	24	61
20	5	120	155	437	3600	437	475	335	101	68	58	52
21	7	103	166	335	1910	595	637	595	84	57	1340	73
22	8	89	304	124	767	437	515	679	73	47	304	144
23	10.5	113	2900	150	555	335	367	515	64	73	178	124
24	19.5	767	2360	200	456	335	274	351	52	65	114	96
25	36	515	1050	250	289	384	244	304	47	43	155	73
26	34	304	595	320	244	811	190	230	64	34	216	58
27	26	230	475	400	367	1500	166	203	155	31	134	47
28	21	190	4400	320	274	1240	155	304	351	25	87	43
29	17.5	155	1730	310	274	3950	351	767	203	23	63	60
30	15.5	274	811	335	-----	3670	515	1970	178	27	47	3530
31	16.5	-----	3040	456	-----	1190	----	857	-----	51	41	-----

Note.—Stage-discharge relation affected by ice Jan. 7-9, 23-29, and Feb. 12-16; discharge estimated by study of observer's notes and weather records.

Monthly Discharge of Tygart River near Dailey, for the year ending September 30, 1924.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1923-24					
October	36	4.5	14	0.072	0.08
November	767	22	156	0.804	0.90
December	4,400	155	835	4.30	4.96
January	3,810	----	845	4.36	5.03
February	3,600	----	570	2.94	3.17
March	3,950	144	732	3.77	4.35
April	1,340	155	453	2.34	2.61
May	6,230	203	1,160	5.98	6.89
June	2,620	47	421	2.17	2.42
July	1,140	23	170	0.876	1.01
August	1,340	20	129	0.665	0.77
September	3,530	28	231	1.19	1.33
The year	6,230	4.5	478	2.46	33.52

Extremes of Discharge (1925).—Maximum stage recorded during year, 9.85 feet at 5 p. m. on March 19 (discharge, 4,700 second-feet); minimum stage, 0.44 foot on morning of September 3, on afternoon of September 11, and on September 12 (discharge, 1.5 second-feet.

Discharge Measurement of Tygart River near Dailey, during the year ending September 30, 1925.

No discharge measurements made during the year.

Daily Discharge, in second-feet, of Tygart River near Dailey, for the year ending September 30, 1925.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1924				1925								
1	1340	13.5		244	182	144	515	811	44	58	41	2.5
2	595	16.5	62	244	767		515	1240	40	67	38	2
3	320	16.5		216	1560		595	857	45	515	28	2.5
4	203	14.5	91	304	903		811	595	41	203	23	5
5	144	13.5	134	274	555	155	903	637	34	134	19	4
6	114	12	811	244	419		637	595	43	120	15.5	3.5
7	94	12	723	216	367	216	437	456	857	111	12	4
8	77	12	950	216	401	216	367	351	401	85	11.5	3.5
9	65	14	1190	190	401	216	289	274	320	60	12	3.5
10	57	15.5	679	178	437	190	216	244	384	48	12	2.5
11	48	19.5	401	419	475	178	203	335	190	41	14.5	1.5
12	44	18	274	1090	450	155	178	1910	103	44	13.5	1.5
13	40	15.5	320	723	351	244	144	857	67	84	13	4
14	35	14.5	475	475	304	595	122	555	53	56	21	6
15	34	18	351	351	1140	555	114	274	44	44	18	10

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
16	30	34	289	384	2040	367	103	289	120	35	15.5	190
17	28	52	244	1910	903	320	92	304	216	94	14.5	87
18	25	41	289	1500	595	367	101	289	304	64	13.5	26
19	24	32	274	811	384	4020	105	230	384	55	12	17
20	24	27	216	950	204	1560	105	190	178	44	8	14
21	22	20	124	679	244	767	100	155	114	82	5	13.5
22	20	166		555	203	437	87	134	84	230	4.5	12
23	19	274		419	178	351	96	111	67	116	6	19.5
24	18	178		304	166	274	92	113	65	81	12	25
25	18	144		274	155	230	437	155	155	61	11.5	23
			} 112									
26	17.5	118		244	144	190	1190	109	367	47	9.5	15.5
27	17	101			144	304	1450	84	190	34	6	13
28	17	89			134	950	723	71	120	31	4.5	12
29	17	77		} 182	-----	767	1140	65	85	26	3.5	12
30	16.5	71			-----	637	998	56	94	21	2.5	11
31	14.5	-----	216		-----	555	----	50	-----	26	2.5	-----

Note.—Discharge estimated, because of ice, from climatic data and observer's notes on Dec. 1-3, 22-30, Jan. 27 to Feb. 1, Feb. 12 and Mar. 2-6. Braced figures show mean discharge for periods indicated.

Monthly Discharge of Tygart River near Dailey, for the year ending September 30, 1925.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1924-25					
October	1,340	14.5	114	0.588	0.68
November	274	12	55.0	0.284	0.32
December	1,190	----	298	1.54	1.78
January	1,910	178	462	2.38	2.74
February	2,040	134	511	2.63	2.74
March	4,020	144	503	2.59	2.99
April	1,450	87	429	2.21	2.47
May	1,910	50	400	2.06	2.38
June	857	34	174	0.897	1.00
July	515	21	87.6	0.452	0.52
August	41	2.5	13.6	0.070	0.08
September	190	1.5	18.2	0.094	0.10
The year	4,020	1.5	254	1.31	17.80

Extremes of Discharge (1926).—Maximum stage during year, 9.50 feet at 5 p. m. on January 22 (discharge, 4,470 second-feet); minimum stage, 0.70 foot at 8 a. m. on October 2 (discharge, 7.8 second-feet).

The following discharge measurement was made during the year ending September 30, 1926:

October 11, 1925: Gage height, 1.37 feet; discharge, 63.1 second-feet.

Daily Discharge, in second-feet, of Tygart River near Dailey, for the year ending September 30, 1926.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1925				1926								
1	9.0	155	244		1240	351	679	304	723	22	274	85
2	9.0	166	216	93	998	320	515	230	515	20.5	101	77
3	20.0	166	304		595		401	190	320	18.	68	244
4	65.0	155	335	190	437	335	384	166	244	17.	47	190
5	811	144	335	1140	401		351	155	274	19.5	36	190
6	203	155	515	723	367		456	144	274	304	34	384
7	100	190	437	401	335	679	1240	120	259	289	31	475
8	70	595	335	289	289	903	857	107	367	190	26	244
9	54	1050	259	203	259	811	637	98	274	105	20	178
10	67	2040	203		555	555	475	87	203	79	18	274
11	68	351	166		470	555	401	82	124	81	17	190
12	58	351	155		410	475	555	77	155	109	17	144
13	230	2360	134	100	351	351	515	74	456	65	12	101
14	216	1620	107		2100	289	515	68	274	55	18	79
15	679	903	100		3390	230	456	61	203	46	18	67
16	555	401	85		1090	216	367	903	166	43	15.5	55
17	1730	555	77		679	190	304	679	134	36	71	46
18	857	419	71	1340	595	178	320	367	107	33	903	41
19	384	401	71	2620	1240	244	811	304	91	32	1730	34
20	259	401	71	1050	1090	1340	515	289	74	30	1790	35
21	203	384	71	857	679	1340	1090	230	63	26	1140	36
22	155	304		4320	595	903	811	335	56	23	437	35
23	144	259		1240	1140	1240	401	166	65	14.5	244	44
24	124	216			800	1140	367	144	82	70	401	52
25	2760	190			637	811	367	120	57	203	1850	82
26	2620	155	64		950	679	367	107	45	71	1400	767
27	998	166		308	595	555	320	114	40	42	515	289
28	595	335			419	555	320	103	36	31	335	190
29	320	367			-----	595	419	92	31	27	178	166
30	166	304			-----	998	351	84	25	27	124	190
31	166	-----		304	-----	903	----	560	-----	25	98	-----

Monthly Discharge of Tygart River near Dailey, for the year ending September 30, 1926.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1925-26					
October	2,760	9.0	474	2.44	2.81
November	2,360	144	509	2.62	2.92
December	515	----	159	0.820	0.95
January	4,320	----	578	2.98	3.44
February	3,390	259	811	4.18	4.35
March	1,340	178	605	3.12	3.60

April	1,240	304	519	2.68	2.99
May	903	61	212	1.09	1.26
June	723	25	191	0.985	1.10
July	304	14 5	69.5	0.358	0.41
August	1,850	12	386	1.99	2.29
September	767	34	166	0.856	0.96
The year	4,320	9.0	387	1.99	27.08

Extremes of Discharge (1927).—Maximum stage recorded during year, 10.06 feet at 8 a. m. on February 6 (discharge, 4,920 second-feet); minimum stage, 0.70 foot at 8 a. m. July 22 (discharge, 7 8 second-feet).

The following discharge measurement was made during the year ending September 30, 1927:

Mar. 24, 1927: Gage height, 2.76 feet; discharge, 435 second-feet.

Daily Discharge, in second-feet, of Tygart River near Dailey, for the year ending September 30, 1927.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1926				1927								
1	555	419	335	384	811	304	723	3180	124	38	367	70
2	475	384	304	289	555	289	1400	1050	103	34	437	55
3	2100	320	274	259	367	216	857	595	144	33	274	44
4	723	230	230	384	304	178	1620	437	166	29	419	39
5	367	190	320	723	998	144	1050	335	216	22	274	34
6	274	144	1790	475	4170	190	1560	274	178	15	203	30
7	216	124	767	367	2620	230	811	244	155	71	113	25
8	166	116	515	304	1140	1340	555	216	134	134	144	24
9	118	105	456		679	1240	1730	178	113	91	2830	45
10	103	351	950		456	637	2490	155	92	63	2300	41
11	89	320	857		367	437	998	166	77	43	811	1340
12	81	259	595		274	320	595	178	71	41	203	304
13	70	216	1400		244	289	437	216	81	39	134	144
14	134	190	1140	220	259	274	555	230	166	81	144	105
15	105	178	679		351	401	515	637	857	65	903	101
16	91	2360	475		320	351	419	1560	367	50	419	71
17	144	1670			351	304	367	2360	230	42	244	56
18	216	857	270		456	244	304	1340	155	34	203	46
19	178	811			4400	230	230	1090	155	24	259	47
20	515	555		3810	1670	998	230	767	166	16	401	55
21	1730	401	2760	3740	998	723	244	767	124	10	903	47
22	555	304	4400	1620	637	950	1240	679	100	30	419	39
23	419	244	1670	1400	1670	679	723	437	87	723	274	32
24	304	203	1340	2160	2040	401	515	335	81	216	190	29
25	950	203	767	1050	857	304	351	259	67	178	134	23
26	723	190	2830	637	723	259	274	259	73	94	105	20
27	475	304	1340	419	515	216	475	289	63	43	79	18
28	335	304	811	367	384	166	857	230	52	29	71	16
29	289	289	857	384	-----	144	998	203	45	25	100	14
30	274	320	679	1140	-----	124	2490	166	41	65	144	12
31	304	-----	456	1730	-----	124	----	144	-----	98	94	-----

Monthly Discharge of Tygart River near Dailey, for the year ending September 30, 1927.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1926-27					
October	2,100	70	422	2.18	2.51
November	2,360	105	419	2.16	2.41
December	4,400	230	970	5.00	5.76
January	3,810	----	776	4.00	4.61
February	4,400	244	1020	5.26	5.48
March	1,340	124	410	2.11	2.43
April	2,490	230	854	4.40	4.91
May	3,180	144	612	3.15	3.63
June	857	41	149	0.768	0.86
July	723	10	79.9	0.412	0.48
August	2,830	71	439.	2.26	2.61
September	1,340	12	97.5	0.503	0.56
The year.	4,400	10	518	2.67	36.25

Extremes of Discharge (1928).—Maximum stage, 13.70 feet at 8 a. m. on June 20 (discharge, 7,750 second-feet); minimum stage, 0.72 foot on October 2 and 3 (discharge, 9 second-feet).

The following discharge measurement was made during the year ending September 30, 1928:

Sept. 17, 1928: Gage height, 1.10 feet; discharge, 38.4 second-feet.

Daily Discharge, in second-feet, of Tygart River near Dailey, for the year ending September 30, 1928.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1927				1928								
1	10	61	190			230	304	4600	155	857	52	304
2	9	55	304		150	166	367	1600	92	475	71	190
3	10	1050	1140	210		166	367	903	190	289	73	155
4	16	1450	637		144	120	335	515	190	203	77	122
5	26	767	595		401	178	304	401	166	190	103	87
6	23	555	456		950	144	244	320	1340	166	61	87
7	15	401	367	216	637	166	216	274	857	124	51	81
8	13	437	300	166	637	144	244	203	515	350	43	71
9	19	1500		178	903	166	203	166	367	289	36	56
10	25	1290	259	178	679	230	178	144	1190	89	31	46
11	26	767	244	144	515	384	230	144	767	74	34	39
12	39	456	637	144	401	335	1620	178	437	289	55	32
13	1140	335	1850	124	367	335	857	144	304	259	46	27
14	244	289	1970	134	401	419	555	124	723	475	32	26
15	166	203	1190	124	1290	351	475	120	351	166	23	26

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
16	134	144	723	114	767	437	335	113	259	116	32	26
17	105	144	555	144	515	1240	274	114	259	81	155	26
18	144	1790		335	401	857	259	144	190	63	109	24
19	950	437		767	335	555	216	134	3600	53	167	26
20	1910	401		2420	335	401	178	274	6180	44	105	679
21	1340	320		857	190	437	155	190	1890	124	70	456
22	679	289		679	166	555	144	155	3570	101	55	216
23	384	274		437	274	2420	456	144	2010	134	49	144
24	274	723	300	274	679	1790	1050	134	1620	105	43	101
25	190	475		679	637	1050	903	134	1500	67	81	76
26	134	367		637	475	723	595	335	723	47	111	61
27	111	289		437	274	515	555	419	384	47	984	52
28	98	679			274	401	637	384	304	107	289	47
29	84	244		160	216	335	1170	289	289	113	155	45
30	74	178			-----	367	3920	216	1560	71	144	64
31	68	-----			-----	335	----	203	-----	51	304	-----

Monthly Discharge of Tygart River near Dailey, for the year ending September 30, 1928.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1927-28					
October	1,910	9	273	1.41	1.63
November	1,790	55	546	2.81	3.14
December	1,970	190	513	2.64	3.04
January	2,420	114	358	1.85	2.13
February	1,290	144	459	2.37	2.56
March	2,420	120	515	2 65	3.06
April	3,920	144	578	2.98	3.32
May	4,600	113	426	2.20	2.54
June	6,180	92	1070	5.52	6.16
July	857	44	181	0.933	1.08
August	984	23	117	0.603	0.70
September	679	24	113	0.582	0 65
The year	6,180	9	427	2.20	30.01

Shavers Fork at Flint.

Location.—At Western Maryland Railway bridge on Thompson Siding, half a mile south of Flint, Randolph County. Upper Pond Lick enters on right half a mile below station.

Drainage Area.—124 square miles (measured on topographic maps).

Records Available.—October 1, 1924, to September 30, 1927.

Gage.—Water-stage recorder on left bank just below railroad bridge; inspected by engineers of West Virginia Power & Transmission Co. Sea-level elevation of zero of gage, 2,407.82 feet.

Discharge Measurements.—Made from cable 800 feet above gage or by wading.

Channel and Control.—Channel straight for 1,000 feet above and below gage. Banks high, wooded, and will not be overflowed. Bed of rock and large boulders with heavy slope to stream. Control composed of rock and large boulders; clean and probably permanent.

Extremes of Discharge.—Maximum stage during year (1925) from water-stage recorder, 6.08 feet at 8 a. m. March 19 (discharge, 3,590 second-feet); minimum stage, 0.59 foot at 4 p. m. August 31 (discharge, 10 second-feet).

Ice.—Stage-discharge relation affected by ice during severe winters.

Regulation.—None.

Diversion.—None.

Accuracy.—Stage-discharge relation permanent; affected by ice November 27-30, December 1-5, 21-31, January 1-16, 28-31, and February 28 to March 4. Rating curve well defined below 3,500 second-feet and fairly well defined above. Operation of water-stage recorder not entirely satisfactory. Daily discharge ascertained by applying mean daily gage height obtained by inspection of recorder graph to rating table except as noted in foot-note to table of daily discharge. Records excellent, except for periods of no gage-height record and when stage-discharge relation was affected by ice, for which they are fair.

Cooperation.—Complete records furnished by West Virginia Power & Transmission Company.

Discharge Measurements of Shavers Fork at Flint, during the years ending September 30, 1924, and 1925.

Date.	Gage height. Feet	Discharge. Sec.-ft.
1924		
Sept. 24	1.96	187
Oct. 30	1.06	36.3
Nov. 8	0.95	26.7
Nov. 20	a 1.02	20.4
Dec. 20	2.24	267
1925		
Mar. 21	2.86	522
Mar. 27	2.20	280
May 5	3.07	632
May 12	3.54	890
Aug. 17	0.82	21.6
Aug. 18	0.79	20.1
Sept. 10	0.68	12.0

a Stage-discharge relation affected by ice.

Daily Discharge, in second-feet, of Shavers Fork at Flint, for the year ending September 30, 1925.

Day.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1924-25											
1				266		249	570	59	109	101	47
2				329		234	570	53	112	84	18
3		75		495	150	259	620	50	392	56	37
4				353		645	495	58	188	45	55
5				282	190	780	595	46	138	39	39

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
6		158		300	165	780	470	161	109	35	27
7		968		353	190	545	372	300	124	32	21
8		1380	110	410	218	450	317		142	32	18
9		1160		717	249	390	266		116	31	16
10	45	545		1030	249	335	266	240	109	30	14
11		353		1610	234	335	807		109	32	12
12		282		1330	249	282	994		107	28	12
13		353		620	351	234	520	83	154	29	19
14		300		470	470	212	390	77	107	35	27
15		234		1230	353	189	470	91	80	32	22
16		234		1190	282	166	317	200	101	29	173
17		300	370	670	282	144	317	330	130	22	126
18		390	840	495	439	160	282	505	107	19	63
19		300	450	390	2150	158	234	449	86	18	41
20	32	266	353	353	840	151	190	249	70	17	32
21	49		266	300	520	130	165	178	148	20	78
22	539		282	266	410	118	151	134	266	99	49
23	310		204	300	335	144	134	112	190	59	76
24	190		165	372	282	130	122	109	116	34	97
25	156		204	317	249	327	138	553	87	24	63
26	112	110	279	300	218	780	114	554	73	18	
27			780	206	380	760	98	266	62	16	
28	75			150	595	595	87	178	53	14	50
29			250	-----	372	780	80	142	48	12	
30				-----	300	570	72	144	41	11	
31	-----			-----	282	-----	64	-----	70	27	-----

Note.—No record Nov. 1-19, June 8-12, Sept. 26-30; discharge estimated. Discharge interpolated Apr. 14-16. Stage-discharge relation affected by ice Nov. 27-30, Dec. 1-5, 21-31, Jan. 1-16, 28-31, Feb. 28 to Mar. 4; discharge estimated from weather records, one discharge measurement, and comparison of flow with records for other stations in the same basin.

Monthly Discharge of Shavers Fork at Flint, for the year ending September 30, 1925.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1924-25					
October	----	----	a 139	1.12	1.29
November	539	----	84.8	0.684	0.76
December	1,380	----	284	2.29	2.64
January	840	----	224	1.81	2.09
February	1,610	150	539	4 35	4.53
March	2,150	----	369	2.98	3.44
April	780	118	368	2 97	3.31
May	994	64	332	2.68	3.09

June	554	46	209	1.69	1.89
July	392	41	121	0.976	1.13
August	101	11	34.8	0.281	0.32
September	173	12	47.7	0.385	0.43
The year	2,150	----	227	1 83	24.92

a Estimated from flow at other stations on this stream.

Extremes of Stage (1926).—Maximum stage recorded during year, 6.19 feet at 2 p. m. August 25 (discharge, 3,740 second-feet); minimum stage, 0.94 foot at 1 p. m. July 23 (discharge, 29 second-feet).

Discharge Measurements of Shavers Fork at Flint, during the year ending September 30, 1926.

Date.	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Gage height. Feet.	Discharge. Sec.-ft.
Nov. 23	2.15	249	May 8	1.88	160
Dec. 4	2.16	228	Aug. 9	1.28	62.6
Feb. 24	3.16	681			

Daily Discharge, in second-feet, of Shavers Fork at Flint, for the year ending September 30, 1926.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1925				1926								
1			204		475	410	1020	335	430	48	216	149
2			190		267		545	317	410	44	138	212
3			204	85	204		570	282	300	41	87	317
4			234		156	220	645	266	249	58	64	317
5	180	390	249				470	234	317	226	68	300
6			410	630			568	190	300	556	295	386
7			282				900	178	266	372	238	450
8			234		170		1070	163	317	200	83	282
9			204				1320	154	249	118	62	230
10			178			430	720	149	190	93	52	423
11			149				620	147	156	216	43	282
12			165	110			863	132	243	168	58	190
13			142		158		545	116	402	112	78	149
14			126		449		450	112	249	97	47	126
15	520		107		768		495	111	234	90	93	112
16		590	114		379		390	450	266	78	93	103
17			98		282	160	353	355	218	68	719	92
18			73		317		353	234	165	55	1320	79
19			93	1250	728		353	266	142	48	1770	69
20			140		658	903	266	282	126	44	1720	64
21			109	496	450	1170	335	234	109	41	940	74
22			179	1760	759	960	643	190	97	34	520	63
23		218	148	542	1260	1720	720	178	118	48	372	74
24		165		335	628	1090	620	156	246	101	483	264
25	540	165		249	1160	1030	545	154	128	183	1830	266

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
26		178			1280	1030	470	147	95	71	1110	1240
27		213	85		620	670	372	395	80	48	545	455
28		450			410	470	450	402	70	38	372	335
29		282		210	-----	410	495	249	61	35	266	335
30		234			-----	470	372	204	54	35	218	353
31		-----			-----	957	----	492	-----	37	178	-----

Monthly Discharge of Shavers Fork at Flint, for the year ending September 30, 1926.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1925-26					
October	----	----	417	3 36	3.87
November	----	165	430	3.47	3.87
December	410	----	152	1.23	1.42
January	1,760	----	378	3.05	3.52
February	1,280	----	456	3.68	3.83
March	1,720	----	536	4.32	4.98
April	1,320	266	585	4.72	5.27
May	492	111	235	1.90	2.19
June	430	54	210	1.69	1.89
July	556	34	110	0.887	1.02
August	1,830	43	454	3.66	4.22
September	1,240	63	260	2.10	2.34
The year	1,830	34	351	2.83	38.42

Extremes of Discharge (1927).—Maximum stage recorded during year, 7.16 feet at 9:10 a. m. November 16 (discharge 5,470 second-feet); minimum stage, 0.96 foot at midnight September 30 (discharge, 30 second-feet).

Discharge Measurements of Shavers Fork at Flint, during the year ending September 30, 1927.

Date.	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Gage height. Feet.	Discharge. Sec.-ft.
Oct. 29	a 2.45	366	May 20	3.15	635
Dec. 14	3.39	768	May 21	2.84	483
Dec. 15	2.95	541	May 21	2.72	437
Feb. 4	2.31	280	May 28	2.47	342
May 9	2.10	206	July 1	1.36	67.2
May 12	2.38	318	Aug. 9	4.78	1,980
May 13	2.59	380	Aug. 12	2.26	251
May 15	3.36	767	Aug. 13	2 09	220
May 16	3.87	1,050	Aug. 17	2.22	255
May 17	4.41	1,500	Sept. 7	1.14	45.2
May 18	3.95	1,140	Sept. 8	1.13	44.0
May 19	3.66	921	Sept. 20	1.37	71.4

(a) Stage-discharge relation affected by cofferdam for new bridge.

Note.—Measurements made by West Penn Power Co.

Daily Discharge, in second-feet, of Shavers Fork at Flint, for the year ending September 30, 1927.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1926				1927								
1	645	450			430	300			218	69	566	92
2	633	353			372	282			190	61	504	78
3	1250	300	240		317	218			249	58	310	69
4	670	266			282	204			353	54	521	61
5	450	234			1310	204	750	580	390	49	327	55
6	470	204		180	2080	246			266	42	218	51
7	390	178			1440	249			234	167	178	48
8	300	163	630		720	1490			218	471	226	45
9	234	195			520	815		204	178	190	2250	102
10	204	590			430	520		190	147	105	768	158
11	178	335			372	430		226	136	82	411	1310
12	165	234	650		300	410		300	132	66	282	371
13	166	234			282		460	372	158	132	218	190
14	300	234	720		355			367	530	257	316	142
15	204	266	570		430			750	868	158	956	122
16	158	2890			317	300		1100	372	100	414	103
17	501	1050			317			1420	266	72	266	84
18	458	685	275		397			1170	218	63	265	73
19	317	785			1720			1030	266	52	407	75
20	661	495	266	1630	780			645	353	44	495	73
21	1040	390	1040	2740	520			495	218	39	564	61
22	545	317	2200	2130	410	630	290	654	178	109	372	52
23	410	282	1020	1910	877			558	217	666	282	48
24	445	266	645	1650	1190			430	204	246	234	44
25	1030	266	817	810	780			353	154	125	204	42
26	593	300	2180	545	595			335	154	90	160	39
27	450	520	930	372	450	360		410	128	72	136	36
28	372	335	645	317	372			372	103	60	122	35
29	372	270	670	410	-----			300	87	54	126	32
30	410	390	475	715	-----		1400	249	78	65	165	31
31	410	-----	390	795	-----		-----	266	-----	224	120	-----

Monthly Discharge of Shavers Fork at Flint, for the year ending September 30, 1927.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1926-27					
October	1,250	158	466	3.76	4.34
November	2,890	163	449	3.62	4.04
December	2,200	----	644	5.19	5.98

January	2,740	----	563	4.54	5.23
February	2,080	282	656.	5.29	5.51
March	1,490	----	415	3.35	3.86
April	----	----	509	4.10	4.57
May	----	190	543	4.38	5.05
June	868	78	242	1.95	2.18
July	666	39	130	1.05	1.21
August	2,250	120	399	3.22	3.71
September	1,310	31	124	1.00	1.12
The year.	----	31	428	3.45	46.80

Shavers Fork at Bemis.

Location.—At highway bridge at Bemis, Randolph County, one-fourth mile below dam of Bemis Lumber Co.

Drainage Area.—114 square miles (measured by West Penn Power Co. on topographic maps).

Records Available.—February 17, 1922, to December 31, 1925.

Gage.—Chain gage near center of bridge on downstream guardrail; read by Alba Willis, Lester Allender, and Richard Litzenburg.

Discharge Measurements.—Made from downstream side of bridge.

Channel and Control.—Channel divided by island 100 feet above station. Series of rapids begin 100 feet above bridge and extend to the dam, one-fourth mile above. Channel below station straight for about 400 feet. Right bank high and wooded, not subject to overflow; left bank low and subject to overflow in extreme high water. Stream bed consists of bed-rock and boulders. Control practically permanent. Point of zero flow about gage height 1.29 feet, September 19, 1922.

Extremes of Stage.—Maximum stage recorded during period of records (1922), 7.20 feet at 4:30 p. m. March 15; minimum stage, 2.62 feet at 7:30 a. m. Aug. 22. Highest flood known reached a stage represented by gage height of about 15.3 feet in the spring of 1918. Rainfall records indicate that this stage must have occurred about the middle of March.

Ice.—Stage-discharge relation affected by ice during winter.

Regulation.—The timber cribbed dam about one-fourth mile above station, for holding logs for sawmill of Bemis Lumber Co., is not used at present; dam is in poor condition.

Diversions.—A planked flume 2 feet by 1 foot with intake at the dam furnishes water to a forebay at sawmill. The flume is in poor condition and most of the water taken out finds its way back to the river; about 2 second-feet (estimated) runs around gage at stages above 5 feet.

Accuracy.—Stage-discharge relation practically permanent except as affected by ice. Rating curve not fully developed. Gage read to hundredths twice daily. Records good.

Discharge Measurements of Shavers Fork at Bemis, during the year ending September 30, 1922.

Date.	Made by—	Gage height. Feet.	Discharge Sec.-ft.
Feb. 17	Dirzulaitis and Bigwood	a 3.95	203
Feb. 21	Dirzulaitis and Bigwood	6.31	1,860
Feb. 21	Dirzulaitis and Bigwood	6.19	1,770
Feb. 22	Dirzulaitis and Bigwood	5.54	1,130
Feb. 22	Dirzulaitis and Bigwood	5.46	1,090
June 6	J. J. Dirzulaitis----------	4.51	476
June 6	J. J. Dirzulaitis----------	4.34	410
Sept. 20	J. J. Dirzulaitis----------	2.82	26.0
Sept. 20	J. J. Dirzulaitis----------	2.82	29.1

a Stage-discharge relation affected by ice.

Daily Discharge, in second feet, of Shavers Fork at Bemis, for the year ending September 30, 1922.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1921				1922								
1						382	824	194	158	90	72	80
2						824	529	170	150	75	65	101
3						668	422	175	197	125	58	92
4						529	362	485	344	344	155	83
5						422	308	620	552	422	48	77
6						442	274	620	362	197	41	56
7						620	257	422	226	143	61	54
8						718	212	325	192	113	464	41
9						464	212	274	274	148	274	35
10						507	186	257	274	99	150	21
11						880	165	257	257	80	99	26
12						620	186	242	824	92	44	58
13						552	141	197	485	107	35	59
14						507	770	507	325	308	37	40
15						1570	1480	242	257	325	41	28
16						880	1000	181	197	257	30	27
17					226	552	869	170	552	226	31	27
18					290	442	738	257	880	257	40	26
19					308	362	606	770	464	325	25	22
20					2380	362	475	464	485	184	19	21
21					1750	362	344	325	529	113	14	20
22					824	257	620	257	362	65	14	20
23					770	257	344	226	274	63	27	19
24					718	362	325	192	242	507	165	18
25					485	529	290	160	175	138	770	18
26					382	442	308	552	145	158	770	14
27					485	464	290	668	212	290	274	17
28					422	880	257	382	145	212	178	17
29					-----	552	257	290	127	61	134	15
30					-----	464	226	242	111	143	109	14
31					-----	485	----	189	-----	168	90	-----

Monthly Discharge of Shavers Fork at Bemis, for the year ending September 30, 1922.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1922					
February 17-28	2,380	226	753	6.55	2.92
March	1,570	257	560	4.87	5.62
April	1,480	141	443	3.85	4 30
May	770	160	333	2.90	3.34
June	880	111	326	2.83	3.16
July	507	61	188	1.63	1.88
August	770	14	140	1.22	1.41
September	101	14	38.5	0.335	0.37

Extremes of Stage (1923).—Maximum stage recorded during period March 22 to September 30, 1923, 7.61 feet at 4:30 p. m. June 13; minimum stage, 2.72 feet at 4:30 p. m. September 8.

Discharge Measurements of Shavers Fork at Bemis, during the year ending September 30, 1923.

Date	Made by—	Gage height. Feet.	Discharge. Sec.-ft.
Mar. 22	James E. Stewart	4.29	341
Apr. 9	James E. Stewart	3.99	223
Aug. 24	Stewart and Davis	3.29	63.5

Daily Discharge, in second-feet, of Shavers Fork at Bemis, for the year ending September 30, 1923.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1922				1923								
1							121	162	62	125	824	26
2							162	138	59	117	485	24
3							143	123	44	87	362	16
4							148	113	382	80	620	194
5							173	103	123	71	668	212
	28	25	530	630	1210	515						
6							574	94	105	75	485	136
7							344	90	162	68	308	115
8							257	96	115	65	274	504
9							242	125	109	87	290	230
10							194	134	65	54	308	173

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
11							168	212	274	43	668	119
12							158	344	718	162	442	92
13							450	344	2740	105	668	50
14							450	257	880	83	620	71
15							485	242	464	59	442	58
	32	55	580	160	300							
16						730	552	274	464	56	212	58
17							362	257	325	38	197	59
18							274	242	226	34	168	36
19							242	197	197	30	138	99
20							212	173	422	21	105	75
21							197	194	197	20	94	
22						325	175	173	138	47	82	
23						1080	152	152	111	192	71	330
24						1080	138	152	162	54	72	
25					140	485	134	83	344	940	61	
	30	40	255	675								
26						382	121	101	162	362	50	94
27						344	189	98	325	160	45	85
28						290	107	101	168	824	37	69
29					-----	212	308	80	308	668	36	65
30					-----	226	212	65	194	362	34	53
31		-----			-----	194	----	65	-----	552	31	-----

Monthly Discharge of Shavers Fork at Bemis, for the year ending September 30, 1923.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1922-23					
October	----	----	30.0	0.26	0.30
November	----	----	40.0	0.348	0.39
December	----	----	449	3.90	4.50
January	----	----	494	4.30	4.96
February	----	----	579	5.03	5.24
March	----	194	567	4.93	5.68
April	----	115	248	2.16	2.41
May	344	65	161	1.40	1.61
June	2,740	44	335	2 91	3.25
July	940	20	182	1.58	1.82
August	824	31	287	2.50	2.88
September	----	16	145	1 26	1.41
The year	----	----	292	2.54	34.45

Extremes of Stage (1924).—Maximum stage recorded during year, 10.60 feet at 4:30 p. m. March 29; minimum stage, 2.79 feet October 15.

Discharge Measurements of Shavers Fork at Bemis, during the year ending September 30, 1924.

Date.	Made by—	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Made by—	Gage height. Feet.	Discharge. Sec.-ft.
Nov. 14	James E. Stewart	3.57	122	Mar. 25	James E. Stewart	3.75	156
Dec. 14	James E. Stewart	4.83	537	Apr. 15	Stewart & Munro	4.94	580
Feb. 8	James E. Stewart	a3.78	153	July 19	James E. Stewart	3.79	152
Mar. 20	James E. Stewart	4.19	293	Sept. 15	James E. Stewart	3.76	160

a Stage-discharge relation affected by ice.

Daily Discharge, in second-feet, of Shavers Fork at Bemis, for the year ending September 30, 1924.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1923				1924								
1	51	44	529	940	186		770	1000	360	144	410	80
2	40	44	344	620	155	140	507	597	376	126	206	94
3	47	29	274	2050	150		422	464	313	126	135	382
4	36	40	226	1000	186	212	529	442	284	126	105	168
5	28	529	422	597	290	620	552	464	243	112	90	109
6	34	308	620	401	574	718	1480	362	218	95	75	109
7	28	290	422		257	485	1400	401	195	206	66	90
8	32	212	344	320	178	308	880	401	218	865	70	77
9	24	170	529				824	1400	1780	500	66	770
10	23	111	824	274			1000	1050	1070	284	49	1080
11	24	111	770	1400			718	1260	500	256	42	507
12	22	141	529	1310			574	5300	445	243	78	325
13	23	138	422	442		150	552	3530	445	1490	164	242
14	21	111	529	325	160		552	1630	500	635	87	194
15	18	103	344	226			620	1340	344	344	59	165
16	20	99	290	507			552	765	313	270	47	136
17	20	226	257	1230		155	464	565	344	218	61	117
18	21	165	226	529		212	620	410	243	195	63	184
19	23	165	192	401		257	824	393	195	154	54	134
20	27	152	197	362	529	308	620	344	164	135	184	117
21	32	130	257		574	325	620	482	144	117	1080	464
22	26	138	401		325	226	485	463	135	102	344	325
23	20	290	1480		212	150	442	328	117	164	242	274
24	41	1000	940			160	362	313	102	144	175	197
25	66	485	529	200		158	308	298	103	95	274	158
26	50	362	401		140	290	290	256	135	86	529	134
27	62	362	302			308	257	243	376	74	274	123
28	44	290	3500			464	257	393	328	61	186	113
29	34	274	824			5290	718	427	195	54	143	242
30	26	529	529	197	-----	2380	422	718	195	82	111	2780
31	71	-----	1750	226	-----	1150	----	463	-----	154	96	-----

Monthly Discharge of Shavers Fork at Bemis, for the year ending September 30, 1924.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1923-24					
October	71	18	33.4	0.290	0.33
November	1,000	29	235	2.04	2.28
December	3,500	192	621	5.40	6.23
January	2,050	----	510	4.43	5.11
February	574	----	214	1.86	2.01
March	5,290	----	510	4.43	5.11
April	1,480	257	621	5.40	6.02
May	----	243	855	7.43	8.57
June	1,780	102	346	3.01	3.36
July	1,490	54	247	2.15	2.48
August	1,080	42	180	1.57	1.81
September	2,780	77	330	2.87	3.20
The year	----	18	393	3.42	46.51

Discharge Measurements of Shavers Fork at Bemis, during the year ending September 30, 1925.

Date	Gage height. Feet.	Discharge. Sec.-ft.	Date	Gage height. Feet.	Discharge. Sec.-ft.
Oct. 31	3.02	34.5	May 6	4.60	457
Nov. 20	a 2.92	19.8	May 12	5.53	1,000
Dec. 18	4.49	317	Aug. 18	2.80	19.1
Dec. 20	4.21	247	Aug. 20	2.77	16.0
Mar. 26	3.99	220			

(a) Stage-discharge relation affected by ice.

Daily Discharge, in second-feet, of Shavers Fork at Bemis, for the year ending September 30, 1925.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1924				1925								
1	690	43			218		232	552	61	101	94	34
2	445	48			284		226	507	54	104	77	16
3	328	39	65		393		212	574	51	365	54	28
4	270	34			284	135	574	464	54	175	43	50
5	230	31			218		668	574	48	128	40	37
6	195	31	135		230		668	464	150	101	33	27
7	174	29	865		298	174	485	346	279	141	30	20
8	154	28	930		381	195	442	295	102	132	32	17
9	135	36	865	100	667	218	363	247	686	108	32	16
10	126	50	445		958	218	312	247	180	101	28	14

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
11	110	47	298		1500	195	312	751	102	101	32	13
12	108	39	256		1240	218	262	824	76	100	28	12
13	92	34	298		577	284	242	485	77	134	27	21
14	89	36	270		437	360	212	363	74	100	34	27
15	78	43	206		1140	284	197	437	85	74	31	20
16	74	72	218		1110	230	175	295	186	96	29	141
17	69	76	270	775	623	243	134	295	307	130	23	125
18	65	55	328	718	393	328	149	262	470	100	20	61
19	59	38	270	393	313	1750	147	218	442	80	18	38
20	58	25	243	328	284	668	140	177	232	68	18	28
21	55	43		230	256	485	132	153	166	138	19	61
22	51	482		256	230	401	110	140	125	242	92	42
23	47	270		190	256	325	134	136	104	181	59	72
24	45	174		153	328	274	121	113	101	113	34	90
25	44	144		195	270	240	304	128	507	82	23	61
			100									
26	42	107		230	256	212	718	106	515	65	18	41
27	42			635	184	362	574	91	247	56	16	40
28	42	65			135	529	529	86	166	50	14	45
29	40			230	-----	362	668	74	132	44	12	42
30	38				-----	285	507	67	134	39	11	33
31	35	-----			-----	265	----	60	-----	65	25	-----

Monthly Discharge of Shavers Fork at Bemis, for the year ending September 30, 1925.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1924-25					
October	690	35	130	1.13	1.30
November	482	25	77.1	0.670	0.75
December	930	----	236	2.05	2.36
January	775	----	214	1.86	2.14
February	----	135	481	4 18	4.35
March	1,750	----	320	2.78	3.20
April	718	110	332	2.89	3.22
May	824	60	307	2 67	3.08
June	686	48	197	1.71	1.91
July	365	39	113	0.983	1.13
August	94	11	33.7	0.293	0.34
September	141	12	42.4	0.369	0.41
The year	1,750	11	205	1.78	24 19

Extremes of Discharge (1926).—Maximum stage recorded during year, 7.69 feet at 2:30 p. m. October 25 (discharge, 3,360 second-feet); minimum stage, 1.10 feet at 7:00 a. m. and 7:00 p. m. October 1 (discharge, 6 second-feet).

Discharge Measurements of Shavers Fork at Bemis, for the period October 1, 1925, to May 12, 1926.

Date.	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Gage height. Feet.	Discharge. Sec.-ft.
1925			1925		
Nov. 22 ---	4.15	242	Dec. 9---	3.98	188
Nov. 23 ---	4.06	208	1926		
Dec. 5----	4.06	231	Feb. 23 --	5.75	1,260
			May 12 --	3.60	118

Daily Discharge, in second-feet, of Shavers Fork at Bemis, for the period October 1, 1925 to December 31, 1925.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1925												
1	28	184	195									
2	27	184	184									
3	66	206	190									
4	226	195	218									
5	529	174	230									
6	230	243	376									
7	158	256	243									
8	117	978	218									
9	111	770	195									
10	123	393										
11	126	284	140									
12	109	270										
13	299	1930										
14	345	1010										
15	955	586										
16	664	598										
17	1220	460										
18	644	310										
19	382	284										
20	274	284										
21	226	270										
22	195	230										
23	178	206	90									
24	207	154										
25	2270	154										
26	930	164										
27	445	195										
28	344	410										
29	256	243										
30	243	218										
31	218	-----										

Note.—Discharge interpolated Apr. 17-20, 1922. Gage-height record unreliable Oct. 1, 1922, to March 21, 1923; discharge estimated. Gage record lost Apr. 13-14, 1923; discharge estimated. Stage-discharge relation affected by ice Jan. 7-9, 21-29, Feb. 9-19, 24-29, Mar. 1-3, 9-16, Nov. 18-21, 27-30, Dec. 1-6, 21-31, 1924, Jan. 1-16, 28-31, Feb. 28 to Mar. 6, Nov. 24-26, and Dec. 15-31, 1925; discharge estimated. On account of inaccuracies of observation and two daily gage readings often not giving actual mean gage height for the day, the discharge estimated Sept. 21-25, 1923, May 9-17, 1924, Jan. 23, 24, Feb. 1, 8-17, Mar. 25, 30, 31, Apr. 1, 9-12, 17-20, May 7-11, 14-22, 24-31, June 4, 6-14, 20-24, 26-30, July 1-9, 11, 12, 14, 15, 18, 31, Aug. 1, 6, 7, 10, 13, 21, 22, 31, Sept. 15, 19, 24, Oct. 5, 6, 10-15, 17, 18, 22-24, Nov. 8, 9, 13-18, Dec. 3, and 10-14, 1925. Gage height in error Apr. 22-25, June 15-18, 1925; discharge estimated. All estimations made by comparison with the flow at other stations in the same basin.

Monthly Discharge of Shavers Fork at Bemis, for the period October 1, 1925 to December 31, 1925.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1925					
October	2,270	27	392	3.41	3.93
November	1,930	154	395	3.43	3.83
December	376	----	138	1 20	1.38

Shavers Fork at Cheat Bridge.

Location—At highway bridge at Cheat Bridge, Randolph County

Drainage Area.—57.5 square miles (measured by West Penn Power Co. on topographic maps).

Records Available.—February 23, 1922, to September 30, 1926.

Gage.—Chain gage near center of bridge on downstream guardrail; read by Blanche Cromer.

Discharge Measurements.—Made from downstream side of bridge or by wading.

Channel and Control.—Channel straight for about 800 feet above and 500 feet below station. Banks low, subject to overflow at extreme high water. Stream bed consists of small boulders and gravel. Control probably permanent. Point of zero flow about gage height 0.26 foot, September 19, 1922.

Extremes of Stage.—Maximum stage recorded during the period of record (1922), 5.2 feet at 7 a. m. June 12; minimum stage, 1.1 feet at 5 p. m. September 30. Highest flood known reached a stage represented by gage height of about 14 feet in July, 1896 (discharge, about 11,000 second-feet). Higher stages have been known but they were due to ice gorges.

Ice.—Stage-discharge relation affected by ice during winter.

Accuracy.—Stage-discharge relation probably permanent; not affected by ice during the period. Rating curve not fully developed. Gage read to hundredths twice daily. Records good.

Discharge Measurements of Shavers Fork at Cheat Bridge, during the year ending September 30, 1922.

Date	Made by—	Gage height. Feet.	Discharge Sec.-ft.
Feb. 23	Dirzulaitis and Bigwood	2.98	450
June 3	J. J. Dirzulaitis	1.96	119
June 4	J. J. Dirzulaitis	1.80	83
June 5	J. J. Dirzulaitis	2.74	371
Sept. 18	J. J. Dirzulaitis	1.24	16.8
Sept. 19	J. J. Dirzulaitis	1.22	14.7

Daily Discharge, in second-feet, of Shavers Fork at Cheat Bridge, for the year ending September 30, 1922.

Day.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1922								
1		218	566	76	72	38	59	43
2		686	282	69	76	38	47	50
3		333	218	110	112	170	84	43
4		266	188	282	91	316	69	48
5		218	164	282	266	170	43	36
6		218	144	234	108	84	34	26
7		646	130	158	80	54	48	22
8		367	125	125	80	48	367	20
9		250	133	112	138	80	120	19
10		401	89	115	128	40	74	18
11		646	91	120	115	34	57	18
12		316	59	98	1050	45	38	30
13		282	80	150	218	43	34	22
14		299	686	234	147	57	31	19
15		1150	810	188	115	203	47	18
16		454	282	105	78	63	50	17
17		299	203	128	350	31	48	16
18		218	203	266	350	61	39	16
19		188	185	526	188	69	28	15
20		250	179	266	316	40	27	15
21		173	203	185	282	34	22	14
22		164	164	150	250	27	20	14
23	436	218	147	120	120	27	19	14
24	384	203	120	98	103	646	42	14
25	250	299	105	87	87	112	299	13
26	203	282	133	566	67	74	367	13
27	350	299	130	266	72	74	110	12
28	316	766	122	185	67	52	82	12
29	--------	350	89	141	63	74	59	12
30	--------	266	84	94	48	100	52	12
31	--------	282	-------	82	-------	69	48	-------

Monthly Discharge of Shavers Fork at Cheat Bridge, for the year ending September 30, 1922.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1922					
February 23-28	436	203	326	5.67	1.27
March	1,150	164	355	6.17	7.11
April	810	59	204	3.55	3.96
May	566	69	181	3.15	3.63
June	1,050	48	175	3.04	3.39
July	646	27	95.9	1.67	1.92
August	367	19	79.5	1.38	1.59
September	50	12	21.4	0.372	0.42

Extremes of Discharge (1923).—Maximum stage recorded during the year, 8.15 feet at 6 p. m. February 1 (discharge, 3,400 second-feet); minimum stage, 1.10 feet on several days during the first part of October (discharge, 12 second-feet).

Discharge Measurements of Shavers Fork at Cheat Bridge, during the year ending September 30, 1923.

Date	Made by—	Gage height. Feet.	Discharge. Sec.-ft.
Mar. 23	James E. Stewart	3.90	813
Mar. 24	James E. Stewart	3.50	642
Mar. 24	James E. Stewart	3.16	506
Apr. 11	James E. Stewart	1.85	92.3
June 30	Stewart and Davis	1.76	74.6
July 1	Stewart and Davis	1.70	61.3
Aug. 23	James E. Stewart	1.55	36.3

Daily Discharge, in second-feet, of Shavers Fork at Cheat Bridge, for the year ending September 30, 1923.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1922				1923								
1	12	13	20	1830	2650		63	78	28	59	367	18
2	13	13	74	282	1150	110	72	65	28	54	185	18
3	12	14	23	203	1100		67	57	250	43	133	20
4	12	14	40	144	436	350	96	56	98	30	350	96
5	12	13	1050	130	266	218	203	43	47	91	234	59
6	12	13	188	120	188	147	367	30	43	43	234	27
7	13	14	133	98	188	566	185	45	52	50	125	84
8	16	14	766	98	179	234	155	47	122	57	87	250
9	17	14	333	96	155	160	125	82	45	34	74	89
10	25	14	218	59	120	161	103	63	31	24	87	52

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
11	40	13	138		96	179	94	108	367	22	316	35
12	20	13	130		87	726	82	266	333	42	606	29
13	17	13	98	60	566	472	188	203	855	39	418	22
14	16	13	141		367	250	122	147	418	35	218	24
15	14	20	472			203	299	110	218	25	120	21
16	15	47	218			686	282	203	185	21	87	21
17	16	21	1200	130	165	418	188	152	110	21	89	20
18	16	20	299			250	141	108	89	19	87	19
19	15	91	234			266	125	87	179	16	69	22
20	14	34	155			218	108	84	115	15	87	28
21	14	21	141	418		176	100	108	78	15	47	566
22	14	27	128	490		152	96	91	63	21	33	122
23	15	20	161	203		810	89	74	45	48	28	61
24	28	18	136			526	84	65	141	28	29	40
25	21	19	82	155	55	266	72	63	144	266	24	35
26	18	21	82			203	61	48	89	56	24	30
27	15	21	57			167	61	52	118	33	20	27
28	15	20	203	950		144	52	59	74	418	20	23
29	14	20	158	367	-----	138	188	36	110	203	22	22
30	14	19	130	218	-----	110	100	69	78	138	16	21
31	14	-----	82	218	-----	67	----	28	-----	316	18	-----

Note.—Stage-discharge relation affected by ice Jan. 11-20, 24-27, and Feb. 15 to Mar. 3; mean discharge estimated from weather records and observer's notes.

Monthly Discharge of Shavers Fork at Cheat Bridge, for the year ending September 30, 1923.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1922-23					
October	40	12	16.4	0.285	0.33
November	91	13	20.9	0.363	0.40
December	1,200	20	235	4.09	4.72
January	1,830	----	244	4.24	4.89
February	2,650	----	321	5.58	5.81
March	810	----	277	4.82	5.56
April	367	52	132	2.30	2.57
May	266	28	88.0	1.53	1.76
June	855	28	152	2.64	2.94
July	418	15	73.6	1.28	1.48
August	606	16	137	2.38	2.74
September	566	18	63.4	1.10	1.23
The year	2,650	12	146	2.54	34.43

Extremes of Stage (1924).—Maximum stage recorded during year, 8.60 feet at 7:30 and 10:30 p. m. May 12 (discharge not determined); minimum stage, 1.13 feet at 6 p. m. October 17, to 6 p. m. October 18 (discharge not determined).

Discharge Measurements of Shavers Fork at Cheat Bridge, during the year ending September 30, 1924.

Date	Made by—	Gage height. Feet.	Discharge. Sec.-ft.
Feb. 8	James E. Stewart	2.20	76.0
Apr. 14	Stewart and Munro	2.94	412
July 18	James E. Stewart	1.84	82.8
Sept. 13	Stewart and Gilardi	1.87	92.1
Sept. 14	Stewart and Gilardi	1.83	83.0

Daily Discharge, in second-feet, of Shavers Fork at Cheat Bridge, for the year ending September 30, 1924.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1923				1924								
1	21	23	302	525			359	575	174	62	311	42
2	20	21	201	302			232	279	202	56	86	68
3	19	18	146	1320	70		217	217	166	68	58	147
4	18	50	133	525			217	217	147	48	49	58
5	16	385	419	268		95	232	217	119	52	40	67
6	17	144	562	189	318		1320	174	110	40	35	49
7	17	123	252		128		660	188	103	134	34	35
8	16	81	214	110			460	248	110	750	42	34
9	16	57	334				495	660	2450	232	30	376
10	16	39	525				615	660	535	137	23	660
11	15	54	436	1560			408	1030	295	88	22	217
12	15	74	268	308			311	2450	248	75	169	129
13	15	59	214	236			343	1740	327	967	67	92
14	15	54	268	174			392	995	263	295	44	82
15	15	39	172	138			408	705	166	188	31	70
16	15	50	183	850		70	359	408	188	110	25	62
17	13	128	146	562			311	311	188	94	38	56
18	13	83	125	268	70		705	232	126	80	36	80
19	15	90	102	208			495	248	100	75	26	58
20	20	65	107	83			425	202	82	64	995	73
21	18	63	130				327	295	75	58	845	327
22	16	79	489				263	232	73	56	152	158
23	18	639	351				217	188	61	155	98	112
24	45	562	419				174	160	59	58	73	80
25	26	252	236			74	155	152	54	51	160	67
26	50	180	198	60		136	152	126	51	47	279	62
27	29	208	189			141	131	169	292	38	103	61
28	23	144	1440			198	158	263	124	34	72	61
29	20	120	454			2620	173	478	76	33	58	995
30	19	562	236		-----	1100	188	359	73	39	51	2030
31	39	-----	1150		-----	575	----	217	-----	174	44	-----

Monthly Discharge of Shavers Fork at Cheat Bridge, for the year ending September 30, 1924.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1923-24					
October	50	13	20.3	0.353	0.41
November	639	18	148	2.57	2.87
December	1,440	102	336	5.84	6.73
January	1,560	----	280	4.87	5.62
February	318	----	80.6	1.40	1 51
March	2,620	----	217	3.77	4.35
April	1,320	131	363	6.31	7.04
May	2,450	126	464	8.07	9.30
June	2,450	51	234	4.07	4.54
July	967	33	141	2.45	2.82
August	995	22	132	2.30	2.65
September	2,030	34	214	3.72	4.15
The year	2,620	13	220	3.83	51.99

Extremes of Discharge (1925).—Maximum stage recorded during year, 6.44 feet at 6:15 a. m. March 19 (discharge, 2,350 second-feet); minimum stage, 1.04 feet at 7 a. m. September 11 and 12 (discharge, 4 second-feet).

Discharge Measurements of Shavers Fork at Cheat Bridge, during the year ending September 30, 1925.

Date.	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Gage height. Feet.	Discharge. Sec.-ft.
Oct. 31	1.34	18.6	May 9	1.98	121
Nov. 21	1.54	23.3	May 11	2.44	242
Dec. 19	2.06	136	May 11	3.70	700
Mar. 27	2.96	413	May 11	4.20	944
Mar. 28	2.30	207	Aug. 19	1.15	8.2
Mar 28	2.50	263	Sept. 12	1.02	4.0
Mar. 29	2.10	162			

Daily Discharge, in second-feet, of Shavers Fork at Cheat Bridge, for the year ending September 30, 1925.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1924				1925								
1	442	26	61				103	217	30	44	52	11
2	263	22	68				100	217	30	92	27	6
3	188	18	62		120		139	217	43	202	20	14
4	147	19	59			90	263	232	28	76	17	22
5	107	18	70				311	295	28	58	17	11
				50								
6	100	18	295				311	202	30	52	22	8
7	88	16	615				232	166	78	86	20	7
8	82	15	895		250	103	202	137	51	49	13	6
9	72	28	495			129	188	119	343	51	18	6
10	67	31	232		478	119	166	116	90	55	15	5

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
11	59	21	155		1040	110	163	408	51	55	13	4
12	55	19	137		535	144	134	442	38	65	14	4
13	51	19	155		279	202	110	217	31	68	15	9
14	45	19	114	110	202	188	96	188	30	42	20	9
15	43	26	376		750	147	94	174	61	39	13	8
16	42	48	343		495	110	82	131	56	88	9	19
17	40	32	217		295	169	76	152	107	56	8	30
18	38		188		217	202	82	121	279	52	8	19
19	33	20	142		174	1210	75	100	116	34	8	9
20	33		119	230	144	359	67	86	73	25	8	7
21	31	36			129	232	62	78	56	45	76	7
22	28	359			126	174	62	72	47	96	51	8
23	28	107			188	147	75	65	42	58	21	26
24	26	70			188	126	62	61	44	36	12	24
25	24	56			155	112	61	61	478	27	10	14
26	24	73	40		142	100	343	56	202	23	8	10
27	22	65		120	90	248	263	49	103	20	7	8
28	24				90	232	217	44	73	18	6	10
29	18	35			-----	150	311	40	61	17	6	8
30	16				-----	129	217	38	52	14	6	7
31	16	-----			-----	114	----	33	-----	36	6	-----

Note.—Gage not read Apr. 29, 1924, and Sept. 7, 8, 10, 1925; discharge interpolated. Stage-discharge relation affected by ice Jan. 7-10, 21-31, Feb. 1-5, 8-29, Mar. 1-24, Nov. 18-20, 28-30, Dec. 21-31, 1924, Jan. 1 to Feb. 9, Feb. 27 to Mar. 7, 1925; discharge computed by use of observer's notes, weather records, seven discharge measurements, and records of flow of Shavers Fork at Flint, Gandy Creek at Horton, Shavers Fork at Parsons, and Cheat River near Parsons.

Monthly Discharge of Shavers Fork at Cheat Bridge, for the year ending September 30, 1925.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1924-25					
October	442	16	72.6	1.26	1.45
November	359	----	44.2	0.769	0.86
December	895	----	169	2.94	3.39
January	----	----	117	2.03	2.34
February	1,040	----	261	4.54	4.73
March	1,210	----	180	3.13	3.61
April	343	61	156	2.71	3.02
May	442	33	146	2.54	2.93
June	478	28	91.7	1.59	1.77
July	202	14	54.2	0.943	1.09
August	76	6	17.6	0.306	0.35
September	30	4	11.2	0.195	0.22
The year	1,210	4	109	1.90	25.76

Extremes of Stage (1926).—Maximum stage, 7.69 feet at 2:30 p. m. Oct. 25 (discharge, 3,360 second-feet); minimum stage, 1.10 feet at 7:00 a. m. and 7:00 p. m. Oct. 1 (discharge, 6 second-feet).

Discharge Measurements of Shavers Fork at Cheat Bridge, during the year ending September 30, 1926.

Date.	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Gage height. Feet.	Discharge. Sec.-ft.
Nov. 21----	2.00	119	Dec. 7---	2.07(a)	118
Nov. 22----	1.97	115	Dec. 7---	2.03	122
Nov. 24----	1.77(a)	63.5	Dec. 8---	1.95	109
Dec. 5----	2.39	231	May 11---	1.80	78.1
Dec. 6----	2.33(b)	200	Aug. 7---	1.61	49.2
Dec. 6----	2.23(b)	169	Aug. 8---	1.50	36.5

(a) Stage-discharge relation affected by ice.
(b) Meter or stage-discharge relation affected by ice.

Note.—Measurements made by West Penn Power Co.

Daily Discharge, in second-feet, of Shavers Fork at Cheat Bridge, for the year ending September 30, 1926.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1925				1926								
1	6	86	88			190	425	188	263	22	217	59
2	8	86	90			160	248	188	248	21	70	80
3	36	112	139				263	163	158	21	52	83
4	86	88	129				295	150	163	23	39	64
5	248	80	188	100			248	103	188	651	172	56
6	61	163	217		80		311	98	174	188	112	50
7	39	134	110				495	92	150	119	51	59
8	32	660	110				750	90	174	70	36	42
9	22	327	100				705	82	116	56	17	45
10	33	188	78			120	376	82	94	52	25	104
11	31	144	78				425	76	82	67	22	50
12	36	327	75				460	70	134	55	22	37
13	174	1100	67				295	64	150	43	22	29
14	80	535	68	50			263	59	94	40	17	30
15	425	327	48				295	61	92	39	65	28
16	169	295	64		190		217	327	96	34	42	29
17	535	232					188	142	72	27	188	25
18	232	158		340			248	100	64	23	795	20
19	147	152	50	390		290	166	158	58	30	750	19
20	121	144		248			158	121	52	22	660	18
21	92	129	67	279		705	263	103	45	18	392	19
22	84	116		820	360	408	478	100	43	15	217	25
23	73	105				1100	478	78	160	88	147	34
24	107	62				495	376	73	94	77	160	67
25	1440	80				575	343	68	56	47	1380	46
26	495	84		100	460	575	263	80	44	26	451	220
27	248	144	50		263	327	217	311	43	22	220	69
28	171	217			230	217	279	174	33	18	147	66
29	129	119			-----	248	248	116	28	18	118	100
30	112	96			-----	202	188	96	23	22	91	183
31	96	-----			-----	795	-----	376	-----	38	76	-----

Monthly Discharge of Shavers Fork at Cheat Bridge, for the year ending September 30, 1926.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1925-26					
October	1,440	6	180	3.13	3.61
November	1,100	----	216	3.76	4.20
December	217	----	77.9	1.35	1.56
January	820	----	140	2.43	2.80
February	460	----	193	3.36	3.50
March	1,100	----	280	4.87	5.62
April	750	158	332	5.77	6.44
May	376	59	129	2.24	2.58
June	263	23	106	1.84	2.05
July	651	15	64.3	1.12	1.29
August	1,380	17	218	3.79	4.37
September	220	18	58.5	1.02	1.14
The year	1,440	6	166	2.89	39.16

Glady Fork at Evenwood.

Location.—At highway bridge at Evenwood, Randolph County. Flannigan Run enters on right one-third mile upstream.

Drainage Area.—41 square miles (measured on topographic maps by West Penn Power Co.)

Records Available.—July 12, 1924, to September 30, 1926.

Gage.—Vertical staff bolted to downstream side of left concrete abutment of highway bridge; read by C. A. Cunningham.

Discharge Measurements.—Made by wading or from foot-bridge about 800 feet upstream from gage.

Channel and Control.—Bed composed of coarse gravel and stones; very rough. Control probably shifts during large floods. Banks low and subject to overflow.

Extremes of Discharge.—Maximum stage recorded during period of record (1924), 2.52 feet at 5:50 p. m. March 19, 1925 (discharge, 626 second-feet); minimum stage recorded, 0.24 foot afternoon of August 30 to afternoon of August 31 (discharge, 0.8 second-foot).

Ice.—Stage-discharge relation probably will be affected by ice during cold periods of ordinary winters.

Regulation.—None.

Accuracy.—Stage-discharge relation changed by high water of March 19, 1925. Two rating curves well defined between 30 and 400 second-feet, fairly well defined between 10 and 30 second-feet and above 400 second-feet. Both curves poorly defined below 10 second-feet.

Cooperation.—Records furnished by West Penn Power Co.

Discharge Measurements of Glady Fork at Evenwood, during the year ending September 30, 1924.

Date.	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Gage height. Feet.	Discharge. Sec.-ft.
July 13 ---	1.71	250	July 20 --	0.66	27.9
July 14 ---	1.53	192	Sept. 13 --	0.85	53.1

Daily Discharge, in second-feet, of Glady Fork at Evenwood, for the year ending September 30, 1924.

Day.	July	Aug.	Sept.	Day.	July	Aug.	Sept.	Day.	July	Aug.	Sept.
1924											
1		48	12	11		9	112	21	22	97	15
2		40	16	12	63	10	73	22	20	53	23
3		30	39	13	218	16	47	23	35	39	29
4		20	19	14	174	12	38	24	30	28	27
5		18	13	15	121	7	30	25	17	30	22
6		14	18	16	82	6	22	26	15	56	17
7		10	15	17	60	7	20	27	13	43	15
8		13	11	18	48	9	22	28	10	39	13
9		12	40	19	36	7	19	29	9	27	29
10		10	128	20	30	35	13	30	16	20	432
								31	32	15	-----

Monthly Discharge of Glady Fork at Evenwood, for the year ending September 30, 1924.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1924					
July 12-31 -------	218	9	52.6	1.28	0.95
August ----------	97	6	25.2	0.615	0.71
September -------	432	11	44.3	1.08	1.20

Discharge Measurements of Glady Fork at Evenwood, during the year ending September 30, 1925.

Date.	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Gage height. Feet.	Discharge. Sec.-ft.
Oct. 20 ---	0.44	10.5	May 9 ---	1.00	70.3
Nov. 23 ---	1.08	78.7	May 13 --	1.59	223.0
Dec. 16 ---	1.16	99.2	Aug. 22 --	0.40	4.85
Mar. 24 ---	1.00	69.1			

Daily Discharge, in second-feet, of Glady Fork at Evenwood, for the year ending September 30, 1925.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1924				1925								
1	326	8			100		87	288	16	33	25	2
2	162	8			95	70	80	288	16	29	17	6
3	107	7	30		168		103	235	14	52	12	5
4	67	6			153	99	307	171	12	30	11	16
5	60	6			138	85	270	128	11	28	11	8
6	39	6	171		128	64	235	107	9	23	10	4
7	31	6	252		146	64	162	93	77	20	10	3
8	27	6	365		180	62	112	80	48	21	8	2
9	24	8	326	50	218	62	80	67	38	20	8	2
10	20	10	235		307	59	67	60	41	21	8	2
11	20	8	133		365	59	62	80	24	21	8	2
12	18	7	95		365	60	48	218	20	19	8	1
13	16	7	162		218	64	42	192	21	23	14	6
14	13	6	118		177	109	36	135	16	17	11	8
15	13	7	106		235	112	32	186	12	16	9	5
16	12	9	95	69	346	95	30	138	41	12	6	30
17	11	14	103	307	235	99	28	116	39	23	4	21
18	10	14	89	288	212	99	31	84	64	20	4	8
19	10	12	87	202	140	560	32	67	73	16	4	6
20	10	9	77	153	87	365	32	59	51	12	3	6
21	9	7		130	69	199	28	51	39	43	4	7
22	8	91		107	62	121	22	42	30	128	5	19
23	8	84		100	55	93	25	36	30	64	5	14
24	7	69		93	57	69	23	38	33	43	3	25
25	7	59		85	56	59	36	50	91	35	3	17
26	7	52	60	89	66	50	432	33	93	29	2	9
27	7	46		307	63	80	365	26	77	23	2	5
28	7	42			63	135	326	23	57	19	1	15
29	7	38		120	-----	130	365	21	43	18	1	14
30	7	34			-----	118	307	19	48	16	1	11
31	7	-----			-----	103	----	17	-----	25	1	-----

Note.—Gage readings in error, and afternoon gage heights estimated July 22 and Aug. 22 and morning gage height of Aug. 23, 1924. Discharge estimated, because of ice or missing gage readings, from climatic data and observer's notes as follows: Nov. 20, 26, 30, Dec. 1-5, 15, 21-31, 1924, Jan. 1-15, 23-24, 28-31, Feb. 1, 27, 28, Mar. 1-3, May 15, 1925.

Monthly Discharge of Glady Fork at Evenwood, for the year ending September 30, 1925.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1924-25					
October	326	7	34.7	0.846	0.98
November	91	6	22.9	0.559	0.62
December	365	----	104	2.54	2.93
January	307	----	102	2.49	2.87
February	365	55	161	3.93	4.09
March	560	50	112	2.73	3.15
April	432	22	127	3.10	3.46
May	288	17	102	2.49	2.87
June	93	9	39.5	0.963	1.07
July	128	12	29.0	0.707	0.82
August	25	1	7.06	0.172	0.20
September	30	1	9.30	0.227	0.25
The year	560	1	70.3	1.71	23.31

Extremes of Discharge (1926).—Maximum stage, 3.10 feet at 6 p. m. Oct. 25 (discharge, 1010 second-feet); minimum discharge, 5 second-feet, July 22.

Discharge Measurements of Glady Fork at Evenwood, during the year ending September 30, 1926.

Date.	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Gage height. Feet.	Discharge. Sec.-ft.
Nov. 20	1.17	102	May 11	0.81	29.5
Nov. 21	1.13	94.8	Aug. 10	0.62	8.9

Oct. 27, 1926: Gage height, 1.42 feet; discharge, 150 second-feet.

Daily Discharge, in second-feet, of Glady Fork at Evenwood, for the year ending September 30, 1926.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1925				1926								
1	9	66	64		311	116	161	55	52	7	39	34
2	10	59	62		311	90	127	49	48	6	27	44
3	24	59	62	30	212		108	45	36	6	21	36
4	37	56	55				93	42	36	9	20	109
5	107	59	59	235	100	70	85	37	48	18	36	156
6	69	62	70	180			138	32	39	42	41	228
7	38	64	67	110			332	27	42	39	23	238
8	33	116	64			150	231	27	46	26	14	156
9	30	180	62				235	27	36	18	11	118
10	36	162	59		35		161	30	24	16	8	111

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
11	33	151	56			120	124	39	18	38	6	85
12	36	288	51	50			111	26	77	31	31	61
13	64	455	43				100	21	123	20	36	50
14	87	252	38		332		90	20	91	21	16	44
15	288	199	38		374	80	81	20	100	16	18	36
16	202	162			311		61	118	79	14	20	31
17	505	130			225	81	49	54	57	12	48	27
18	388	116	30	190	192	67	51	51	51	8	238	23
19	180	107		432	311	116	44	91	42	7	581	20
20	118	101		218	292	256	40	75	34	6	700	17
21	85	91	33	192	192	311	63	62	28	6	332	27
22	70	84	47	610	212	238	65	54	26	5	179	23
23	64	77		256	444	273	76	52	42	41	109	36
24	73	73		173	238	256	69	50	45	38	134	57
25	410	67	25	130	208	186	72	51	28	28	524	51
26	532	53			273	161	63	51	17	16	332	192
27	270	57			235	127	59	87	15	12	192	111
28	156	70		60	183	100	67	83	14	9	116	95
29	95	64	15		-----	88	67	70	11	8	66	77
30	80	64			-----	111	59	59	7	16	54	71
31	70	-----		140	-----	150	----	61	-----	26	41	-----

Monthly Discharge of Glady Fork at Evenwood, for the year ending September 30, 1926.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1925-26					
October	532	9	135	3.29	3.79
November	455	53	118	2.88	3.21
December	70	----	40.5	0.988	1.14
January	610	----	122	2.98	3.44
February	444	----	193	4.71	4.90
March	311	----	130	3.17	3.66
April	332	40	103	2.51	2.80
May	118	20	50.5	1.23	1.42
June	123	7	43.7	1.07	1.19
July	42	5	18.2	0.444	0.51
August	700	6	129	3.15	3.63
September	238	17	78.8	1.92	2.14
The year	700	5	96.2	2.35	31.83

Laurel Fork at Wymer.

Location.—30 feet above highway bridge at Wymer, Randolph County. Job Run enters on right one-third mile upstream.

Drainage Area.—44 square miles (determined by West Penn Power Co.)

Records Available.—July 14, 1924, to September 30, 1926.

Gage.—Vertical staff on right bank; read by Noil Carr and Mrs. John White; in 1926 by Mrs. Lucretia Smith.

Discharge Measurements.—Made by wading about 600 feet upstream from gage.

Channel and Control.—Bed composed of flat stones and a small amount of coarse gravel. Control probably permanent except during extreme floods or when disturbed by human agency. Left bank high and is not overflowed. Right bank low and is overflowed during extreme floods.

Extremes of Discharge.—Maximum stage recorded during period of record (1925), 2.78 feet at 7 a. m. March 19, 1925 (discharge, 728 second-feet); minimum stage, 0.32 foot August 28 to September 1, 1925 (discharge, 1.4 second-feet).

Ice.—Stage-discharge relation probably will be affected by ice during cold periods in ordinary winters.

Regulation.—None.

Accuracy.—Stage-discharge relation permanent, except October 6-20, 1924, when unknown parties built wing dam opposite gage. Rating curve well defined between 30 and 300 second-feet; fairly well defined above 300 second-feet and between 8 and 30 second-feet; poorly defined below 8 second-feet. Daily discharge ascertained by applying mean daily gage height to rating table except as noted in foot-note to table of daily discharge.

Cooperation.—Records furnished by West Penn Power Co.

Discharge Measurements of Laurel Fork at Wymer, during the year ending September 30, 1924.

Date.	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Gage height. Feet.	Discharge. Sec.-ft.
July 14	1.66	207	Sept. 12	0.99	46.8
July 21	0.81	29.3			

Daily Discharge, in second-feet, of Laurel Fork at Wymer, for the year ending September 30, 1924.

Day.	July	Aug.	Sept.	Day.	July	Aug.	Sept.
1924							
1		66	17	16	94	7	24
2		44	25	17	68	12	21
3		31	40	18	52	12	24
4		23	22	19	39	8	24
5		18	20	20	32	48	23
6		14	19	21	26	89	45
7		16		22	24	48	32
8		14		23	36	33	29
9		13	65	24	25	28	25
10		10		25	17	44	23
11		7	65	26	17	76	23
12		19	46	27	14	51	22
13		20	40	28	12	40	22
14	208	12	34	29	10	32	41
15	128	9	27	30	21	25	620
				31	48	21	-------

Monthly Discharge of Laurel Fork at Wymer, for the year ending September 30, 1924.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1924					
July 14-31	208	10	48.4	1.10	0.74
August	89	7	28.7	0.652	0.75
September	620	17	53.7	1.22	1.36

Discharge Measurements of Laurel Fork at Wymer, during the year ending September 30, 1925.

Date.	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Gage height. Feet.	Discharge. Sec.-ft.
Oct. 21	0.64	11.1	Mar. 24	1.18	80.8
Nov. 23	1.10	65.8	May 8	1.19	81.9
Dec. 15	(a) 1.48	163	May 13	1.66	216
Dec. 16	1.23	100	Aug. 23	0.51	6.51
Mar. 23	1.255	99.5			

(a) Stage-discharge relation may have been affected by ice.

Daily Discharge, in second-feet, of Laurel Fork at Wymer, for the year ending September 30, 1925.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1924				1925								
1	347	11			78		99	275	16	32	22	1
2	168	11			102	65	107	258	14	28	14	3
3	99	10	25		176		99	208	13	49	10	4
4	80	10			162	91	310	165	12	39	10	11
5	63	8			157	78	328	149	11	29	9	6
6	45	8	185		162	64	241	138	10	19	7	4
7	31	8	258		168	63	152	107	52	18	10	3
8	27	8	328	35	179	61	109	86	24	18	7	2
9	25	13	347		241	66	91	72	21	16	6	2
10	23	16	193		310	63	74	66	25	16	10	2
11	22	12	133		366	58	66	107	17	17	7	2
12	20	10	102		328	61	54	292	12	20	6	2
13	19	10	154		224	70	45	241	11	41	9	5
14	17	10	154		168	122	40	154	10	22	8	5
15	16	14	128		275	125	36	193	8	16	6	5
16	16	26	102	59	366	91	32	152	46	17	4	14
17	15	24	115	347	224	109	28	138	26	22	4	22
18	14	16	107	410	173	109	33	102	59	21	3	11
19	14	13	99	224	122	680	32	82	56	13	3	6
20	14	10	84	141	99	347	31	63	39	12	4	4

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
21	14	8	80	112	84	208	24	49	24	32	4	5
22	14	86		107	70	143	21	35	21	82	7	6
23	13	63		91	66	104	26	27	20	52	6	7
24	12	59		52	68	89	23	36	30	31	4	11
25	12	51	50	76	61	66	23	48	99	26	2	10
26	11	44		78	58	61	388	33	91	20	2	6
27	12	37		310	37		275	27	70	17	2	5
28	12	30			48		292	24	52	15	1	13
29	11	26	32		-----	120	310	21	44	13	1	7
30	11	26	39	110	-----		258	20	44	11	1	6
31	11	-----	44		-----		----	17	-----	17	1	-----

Note.—Observer's readings in error morning of July 30, morning of Aug. 8, Sept. 7-14, Dec. 31, 1924, afternoon of Feb. 22 to afternoon of Feb. 23, morning of Mar. 13, 27-31, 1925. Discharge estimated Sept. 1-11 on basis of hydrographer's readings Sept. 12 and interpolated Sept. 13 and 14, 1924, and July 4 and 5, 1925. Gage height estimated for all other erroneous readings. Discharge estimated, because of ice, from climatic data Nov. 22, 26, 27, 29, Dec. 1-5, 22-29, 1924, Jan. 1-15, 28-31, Mar. 1-3, 1925.

Monthly Discharge of Laurel Fork at Wymer, for the year ending September 30, 1925.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1924-25.					
October	347	11	39.0	0.886	1.02
November	86	8	22.6	0.514	0.57
December	347	----	102	2.32	2.68
January	410	----	95.9	2.18	2.51
February	366	37	163	3.70	3 85
March	680	58	120	2.73	3.15
April	388	21	122	2.77	3.09
May	292	17	109	2.48	2.86
June	99	8	32.6	0.741	0.83
July	82	11	25.2	0.573	0.66
August	22	1	6.13	0.139	0.16
September	22	1	6.33	0.144	0.16
The year	680	1	69.8	1.59	21.54

Extremes of Discharge (1926).—Maximum stage, 3.30 feet at 6 p. m. Oct. 25 (discharge 1100 second-feet); minimum stage, 0.45 foot at 7 a. m. Oct. 2 (discharge, 4 second-feet).

Discharge Measurements of Laurel Fork at Wymer, during the year ending September 30, 1926.

Date.	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Gage height. Feet.	Discharge. Sec.-ft.
Nov. 20	1.37	116	Aug. 10	0.55	7.0
May 10	0.82	29.2			

Oct. 27, 1926: Gage height, 1.43 feet; discharge, 144 second-feet.

Daily Discharge, in second-feet, of Laurel Fork at Wymer, for the year ending September 30, 1926.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1925				1926								
1	5	66	63		208	128	193	54	61	11	23	35
2	5	64	54		154		146	49	61	10	15	61
3	15	70	74	25	115		135	45	45	10	11	46
4	25	63	66			55	130	45	48	10	12	74
5	109	56	70	176			109	37	56	27	14	86
6	54	63	91	179			154	33	49	37	29	122
7	35	63	78	120			366	30	49	39	15	135
8	24	109	68	63	60		258	27	56	24	11	99
9	20	193	63			110	208	25	44	17	8	78
10	24	152	59				157	26	36	15	8	82
11	21	117	46				135	25	32	28	6	59
12	25	104	46	50			149	20	66	21	6	52
13	44	366	39				133	19	96	15	12	45
14	49	347	34		347		120	17	66	23	8	36
15	193	224	28		435	50	115	16	64	14	13	32
16	149	275	32		220		84	80	56	12	20	26
17	460	182		51	152		68	63	46	11	30	21
18	310	146	25	292	187	41	68	52	37	9	112	19
19	185	133		388	460	109	63	64	39	8	435	16
20	122	130	29	258	410	275	48	58	33	8	590	15
21	91	109	27	208	224	310	76	51	22	7	292	18
22	78	94	42	620	275	258	133	46	23	6	157	21
23	64	82			460	310	104	40	39	14	109	30
24	89	70			258	258	99	46	51	27	133	32
25	560	65		160	347	208	94	45	25	34	366	32
26	485	54			347	190	84	42	20	15	328	152
27	241	59	20		208	146	72	96	18	11	182	78
28	149	82			154	115	76	82	15	9	115	64
29	107	66			-----	120	70	70	13	8	78	64
30	84	63		55	-----	168	63	58	11	8	61	61
31	76	-----			-----	208	----	76	-----	18	58	-----

Monthly Discharge of Laurel Fork at Wymer, for the year ending September 30, 1926.

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1925-26					
October	560	5	126	2.86	3 30
November	366	54	122	2.77	3.09
December	91	----	40.8	0.927	1.07
January	620	----	125	2.84	3.27
February	460	----	199	4.52	4.71
March	310	----	128	2.91	3.36
April	366	48	124	2.82	3.15
May	96	16	46.4	1.05	1.21

June	96	11	42.6	0.968	1.08
July	39	6	16.3	0.37	0.43
August	590	6	105	2.39	2.76
September	152	15	56.4	1.28	1.43
The year	620	5	93.5	2.12	28.86

Gandy Creek at Horton.

Location.—At lumber railroad bridge half a mile upstream from Horton, Randolph County. Lower Two Spring Run enters on right just above station.

Drainage Area.—36 square miles (determined by West Penn Power Co.)

Records Available.—July 15, 1924 to September 30, 1926.

Gage.—Vertical staff attached to downstream side of right abutment of railroad bridge; read by J. W. White.

Discharge Measurements.—Made by wading a short distance downstream from gage.

Channel and Control.—Bed composed of coarse gravel and stones; very rough. Control probably shifts during large floods. Banks low and subject to overflow.

Extremes of Discharge.—Maximum stage recorded during period of record, 2.70 feet at 6:30 a. m. September 30, 1924 (discharge, 550 second-feet); minimum stage, 0.55 foot at 7 a. m. September 12, 1925 (discharge, 3 second-feet).

Ice.—Stage-discharge relation affected by ice during exceptionally cold periods.

Regulation.—None.

Accuracy.—Stage-discharge relation probably permanent, during period of record, except for the effect of light, small drift that lodges on control during low-water periods. Gage read to hundredths twice daily.

Cooperation.—Records furnished by West Penn Power Co.

Discharge Measurements of Gandy Creek at Horton, during the year ending September 30, 1924.

Date.	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Gage height. Feet.	Discharge. Sec.-ft.
July 15	1.57	113	Sept. 12	0.86	15.7
July 21	1.00	28.2	Sept. 22	0.81	12.8

Daily Discharge, in second-feet, of Gandy Creek at Horton, for the year ending September 30, 1924.

Day.	July	Aug.	Sept.	Day.	July	Aug.	Sept.	Day.	July	Aug.	Sept.
1924				1924.				1924.			
1		26	12	11		6	23	21	35	38	21
2		16	15	12		16	15	22	35	14	13
3		13	21	13		12	12	23	41	10	11
4		11	12	14		8	12	24	28	9	10
5		10	11	15	107	6	11	25	24	16	8
6		9	10	16	81	6	10	26	23	58	8
7		8	9	17	64	8	10	27	19	32	8
8		9	8	18	54	7	10	28	18	23	8
9		8	24	19	41	6	10	29	16	19	47
10		7	31	20	35	21	10	30	15	16	462
								31	20	14	-----

PLATE LXVII.—Valley Head Sandstone of Chemung in cut of Staunton and Parkersburg Pike along Riffle Creek 4½ miles southeast of Huttonsville and one-half northwest of Riffle School, partly showing fossil tree zone at extreme right top and showing an old root in bed of creek, indicated by dark color and two-foot rule.

(Photo. by E. E. Harris.)

PLATE LXVIII.—Elkins Sandstone of Chemung in cut of Staunton and Parkersburg Pike north of East Fork of Greenbrier River and 0.5 mile east of Durbin, Pocahontas County, at Fossil Lot 426, showing cross-section of a tree, flattened at top, rounded at the base, and 5 feet in diameter. (Photo. by E. E. Harris.)

PLATE LXIX.—View from top of low knob three-fourths mile northwest of Montrose, looking north up valley of Leading Creek and showing Chemung topography in background followed by Portage in lower hills and immediate foreground. (Photo. by E. E. Harris.)

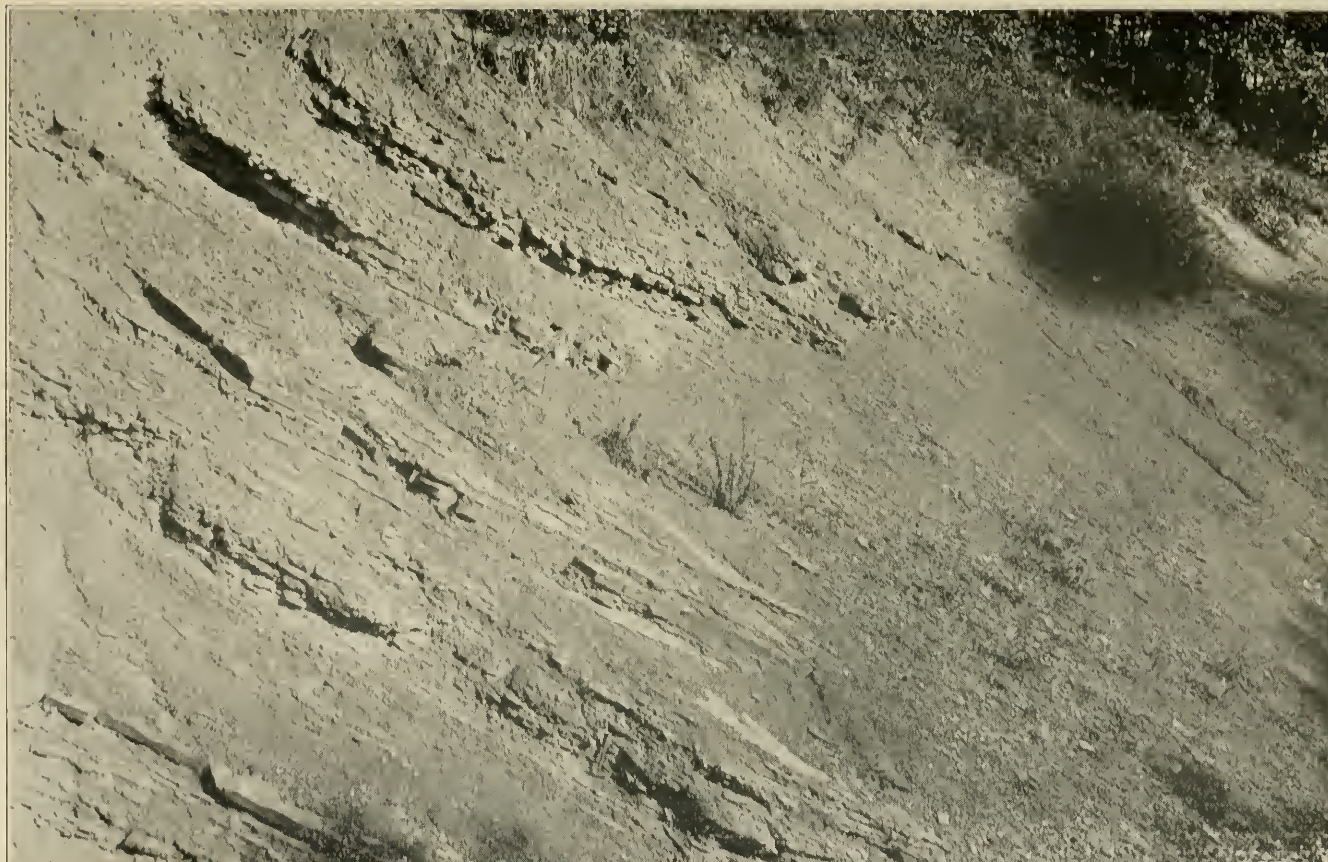


PLATE LXX.—Portage-Chemung contact in cut of **Western** Maryland Railway at Fossil Lot 357 on headwaters of Leading Creek, 1.5 miles northeast of Montrose. Hammer in lower middle indicates contact, the Chemung above being full of **Ambocoelia umbonata** while the Portage below is barren. (Photo. by E. E. Harris.)

Monthly Discharge of Gandy Creek at Horton, for the year ending September 30, 1924.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1924					
July 15-31	107	15	38.6	1.07	0.68
August	58	6	14.9	0.414	0.48
September	462	8	29.1	0.808	0.90

Discharge Measurements of Gandy Creek at Horton, during the year ending September 30, 1925.

Date.	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Gage height. Feet.	Discharge. Sec.-ft.
Oct. 20	0.82	12.8	May 13	1.83	180
Dec. 16	1.32	67.4	Aug. 22	0.715	8.31
Mar. 25	1.295	65.4	Sept. 13	0.56	2.48
May 8	1.32	66.6			

Daily Discharge, in second-feet, of Gandy Creek at Horton, for the year ending September 30, 1925.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1924				1925								
1	232	10	28	43	67	54	61	194	19	36	23	6
2	130	9	30	38	72	56	64	177	18	30	13	4
3	90	8	35	36	92	61	94	142	19	35	11	6
4	67	7	37	30	90	52	166	120	18	24	12	8
5	54	7	50	21	87	59	200	107	15	23	10	5
6	45	7	139	23	100	46	180	90	13	22	10	4
7	39	6	180	24	107	45	139	76	96	21	9	4
8	35	6	282	24	120	49	107	68	58	25	8	-----
9	30	11	300	20	183	49	83	63	49	18	13	4
10	26	12	197	24	265	46	72	61	43	16	9	4
11	23	8	134	26	362	44	61	118	35	15	7	3
12	21	8	100	24	340	46	51	216	28	17	8	3
13	19	7	130	23	216	74	44	177	24	72	7	3
14	18	8	102	23	144	94	39	149	23	32	8	4
15	17	11	83	22	248	92	37	166	21	24	6	5
16	16	15	66	28	282	85	32	125	45	24	6	8
17	15	13	76	216	216	88	29	113	44	25	5	11
18	13	10	72	186	149	87	30	87	51	19	5	6
19	13	8	64	134	116	435	29	72	51	16	6	4
20	13	11	60	111	90	265	27	60	45	15	5	4
21	12	10	56	87	73	177	24	54	40	22	8	6
22	12	66	55	76	64	130	23	46	35	41	8	5
23	11	50	54	70	59	94	24	40	32	24	5	7
24	10	49	53	81	59	76	22	41	32	19	4	8
25	10	45	51	70	52	64	22	49	90	16	4	5

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
26	10	46	50	72	54	56	50	35	81	15	4	4
27	10	41	49	149	51	63	79	29	70	13	4	4
28	10	37	46	83	49	66	116	26	60	12	4	6
29	10	34	46	98	-----	64	166	24	50	11	4	5
30	9	30	51	94	-----	64	183	23	45	10	3	5
31	8	-----	55	87	-----	64	----	21	-----	21	4	-----

Note.—Discharge estimated Dec. 22-25, 1924, because of ice.

Monthly Discharge of Gandy Creek at Horton, for the year ending September 30, 1925.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1924-25					
October	232	8	33.2	0.922	1.06
November	66	6	19.7	0.547	0.61
December	300	28	88.1	2.45	2.82
January	216	20	65.9	1.83	2.11
February	362	49	136.	3.78	3.94
March	435	44	88.5	2.46	2.84
April	200	22	75.1	2.09	2.33
May	216	21	89.3	2.48	2.86
June	96	13	41.7	1.16	1.29
July	72	10	23.	0.639	0.74
August	23	3	7.52	0.209	0.24
September	11	3	5.17	0.144	0.16
The year	435	3	55.7	1.55	21.00

Extremes of Discharge (1926).—Maximum stage recorded, 2.68 feet at 6 p. m. Aug. 25 (discharge, 538 second-feet); minimum stage recorded, 0.58 foot at 7 a. m. Oct. 2 (discharge, 4 second-feet).

Discharge Measurements of Gandy Creek at Horton, during the year ending September 30, 1926.

Date.	Gage height. Feet.	Discharge. Sec.-ft.	Date.	Gage height. Feet.	Discharge. Sec.-ft.
Nov. 19	1.54	106	Aug. 10	0.97	22.2
Nov. 20	1.54	102			

Note.—Measurements made by West Penn Power Co.

Daily Discharge, in second-feet, of Gandy Creek at Horton, for the year ending September 30, 1926.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1925				1926								
1	4	46	44		171	122	216	47	58	16	23	42
2	5	49	43		130	105	166	43	53	15	20	53
3	8	46	73	15	107	90	155	41	43	17	37	43
4	16	41	64		83	81	134	37	48	25	29	54
5	36	40	70	111	70	74	113	33	52	27	52	42

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
6	18	44	79	73	60	83	120	31	53	33	48	40
7	11	44	73	60	59	116	216	29	52	31	37	40
8	8	90	70		56	134	200	27	58	23	31	33
9	7	102	63		51	107	163	25	45	20	25	31
10	8	90	56			83	122	25	40	20	21	37
11	8	79	51		50	87	116	24	36	29	18	29
12	10	116	49	50		72	120	20	46	21	15	24
13	13	362	44		63	65	105	18	53	16	14	21
14	17	282	38		232	60	98	17	39	16	17	20
15	44	194	37		265	60	87	19	40	16	18	20
16	35	248	32		166	50	76	45	36	14	14	18
17	116	163	24		134	43	65	33	32	12	40	16
18	70	130	19	232	142	42	64	27	28	11	58	15
19	51	111	19	320	320	88	54	35	25	10	340	14
20	40	100	18	216	232	168	47	36	23	9	385	12
21	34	83	24	177	180	216	64	33	20	8	232	15
22	31	73	35	320	232	191	79	32	20	10	149	14
23	28	64	28	248	362	265	79	32	53	11	107	13
24	44	61	23	188	232	232	79	36	46	47	111	17
25	232	54		120	300	188	81	36	32	59	435	15
26	232	47		79	300	194	70	36	30	36	320	67
27	127	50		70	200	144	64	77	26	28	188	29
28	90	59	15	61	147	113	69	70	22	22	120	22
29	72	47		60	-----	109	60	67	20	20	83	25
30	61	44		50	-----	122	52	59	19	19	67	33
31	54	-----		137	-----	177	----	74	-----	21	53	-----

Monthly Discharge of Gandy Creek at Horton, for the year ending September 30, 1926.

Month.	Discharge in second-feet. Maximum.	Minimum.	Mean.	Per square mile.	Run-off in inches.
1925-26					
October	232	4	49.4	1.37	1.58
November	362	40	98.6	2.74	3.06
December	79	----	38.1	1.06	1.22
January	320	----	99.4	2.76	3.18
February	362	----	159	4.42	4.60
March	265	42	119	3.31	3.82
April	216	47	104	2.89	3.22
May	77	17	37.5	1.04	1.20
June	58	19	38.3	1.06	1.18
July	59	8	21.4	0.594	0.68
August	435	14	100	2.78	3.20
September	67	12	28.5	0.792	0.88
The year	435	4	73.82	2.05	27.82

MINERAL WATERS.

MINERAL SPRINGS.

No mineral springs have been commercially exploited within the county, and, so far as known, the possibilities in this respect are slight. At Norton the **William Corley No. 9 (48) Coal Test Boring,** located on the north side of Tygart River at the Western Maryland Railway station, flows a strong stream of sulphur water which has been used for local consumption in Elkins.

POSSIBLE SOURCES OF MINERAL WATERS.

In the drilling of tests for coal, oil, and gas, it is frequently the case that strong mineral waters, containing hydrogen sulphide, sodium chloride, and other chemicals useful for medicinal or chemical purposes are often found. Little or no record of such water has been noted in the holes already made but a careful notation of the amount and chemical content of all such apparent mineral water found in future drilling would be of value. It is quite possible that artificial medicinal springs could be developed by drilling wells near the outcrop of the limestones of the Greenbrier Series, and lower part of the Mauch Chunk Series, since it is not uncommon for meteoric water to become mineralized by passing through porous or creviced limestone. It is also probable that minerals of some future value may be recovered from acid coal mine waters, although it is not apparent that the waters coming from the present mines of the county are highly acid. Alkaline waters may contain some of the same minerals but their recovery, from a chemical standpoint, would be much more difficult. In general, a mine water which is highly corrosive to mine pipes, rails, and pumps, and from which the iron oxide readily separates when entering the stream, should have chemical possibilities.

IRON ORE.

GENERAL SCARCITY OF IRON ORE.

Iron ore, in the sense of commercial deposits workable by present mining and metallurgical methods, does not exist in the county. In some localities, notably in the sandy shales overlying some of the coal seams, there are nodules of iron carbonate which would probably be rich enough for treatment if they could be mined in quantity but in every case these nodules are so scattered that they comprise only a small fraction of the total shale and could not possibly be mined with profit.

In the red shales of the Mauch Chunk and Catskill Series there is an iron oxide content usually varying from seven to eight per cent. and making in the aggregate an immense amount of iron which is locked up in these shales, as is evident from the analysis of a sample (No. 693R) from the Coney Shale of the Mauch Chunk from the land of **Davis and Elkins** on the eastern end of Point Mountain, page 297; also from a sample (No. 696R) from the Indian Mills Shale of the Mauch Chunk taken from the **Davis Coal Land Company** property on Shavers Fork above Flint and published on page 301; and also from a sample (No. 690R) taken from the Catskill red shale on the land of **Isaac Painter** on Ralston Run west of Valley Head, as published on page 360. These and other red shales of the same two series could be mined very cheaply from inexhaustible deposits but unfortunately no present metallurgical method is capable of reducing them to pig iron in competition with the rich ores of commerce which contain five to ten times as much iron oxide.

OCHER.

Ocher does not appear to exist in quantity in the county but there are some small isolated occurrences. At the **Lonnie Stalnaker Ocher Prospect,** located in Leadsville District on a branch of Leading Creek 0.2 mile east of Read Station and two miles north of Elkins, some excavation was once made for red ocher in the bed of this small branch. Here the ocher adheres to particles of shale or pebbles, being apparently derived from the leaching of the Devonian country rock. From the appearance of these diggings it does not seem that more than a few tons of ocher could possibly be recovered and this would be difficult to separate from the debris with which it is associated. A sample (No. 672R) collected on the land of Mr. Stalnaker, shows the following analysis according to Kaplan and Sigwart:

	Per cent.
Silica (SiO_2)	53.12
Ferric Iron (Fe_2O_3)	23.00
Alumina (Al_2O_3)	13.52
Magnesia (MgO)	0.83
Loss on Ignition	7.54
Undetermined	1.99
Total	100.00

In Dry Fork District at the Randolph-Pocahontas County line where the Western Maryland Railway makes a heavy cut between the waters of West Fork of Glady Fork of Cheat River and West Fork of Greenbrier River, there is visible a conglomeration of red shale, greenish-gray transported clay, rounded boulders, white quartz pebbles, rotten peaty muck, and pockets of yellow ocher. This cut is about 30 feet deep, the elevation of its base being 3145′ B. The ocher occurs in isolated pockets, being of such small quantity and so mixed with other material that it did not appear to be worth sampling. On some of the boulders at this locality there are indications of striations which suggest glacial action which could scarcely be explained except by the presence of local ice sheets on the adjacent mountains, which formed a terminal or possibly medial moraine in or near the valley of an ancient river. The presence of a water course of considerable size is clearly indicated by the rounded boulders but it is not apparent whether this water was flowing southward toward the Greenbrier Valley or northward toward Cheat.

MANGANESE.

TRACES OF ORE.

Evidence of manganese is not lacking in the county but there is little or no indication that any commercial deposits will be found. Many of the rocks are stained or colored black with it, but it is well known that a mere trace is sufficient to cause such an effect. In Dry Fork District the **Charles Judy Manganese Prospect** was once opened on the Pocono-Greenbrier shelf east of Laurel Fork of Cheat 0.8 mile south of the Elkins-Franklin road and 2.1 miles west of Job at elevation 3100′ B. Here there is a small accumulation of manganese occurring at the top of the Pocono Series and possibly derived from the disintegration of the limestones of the Greenbrier which once covered the locality but which are now eroded for a distance of several hundred feet to the eastward, leaving only the bare eastward-dipping slope of the Pocono. The top of the sandstone, which is pebbly and coarse, is much disintegrated and is encrusted with a lean coating of manganese, some of the surfaces exhibiting botryoidal structure. A small pit was dug to search for better ore but it has now filled up and it is impossible to tell how deep into the sandstone the impregnation may have occurred. According to Mr. Judy the manganese is visible along the Pocono-Greenbrier contact for half a mile or more farther to the south. A sample (No. 707R) was collected from some of the incrustations at the prospect, the composition of which is reported as follows by Kaplan:

	Per cent.
Silica (SiO_2)	54.60
Ferric Iron (Fe_2O_3)	10.00
Manganese Dioxide (MnO_2)	26.88

It is evident from the analysis that this ore is quite lean and it is further evident on the ground that no great amount of it could be mined, and it is therefore principally of scientific rather than of commercial interest.

The **S. T. Lukens Manganese Prospect** is located near the same Pocono-Greenbrier contact 0.6 mile south of the Judy Prospect and 1.4 miles south of the Elkins-Franklin road and 2.2 miles southwest of Job, at elevation 3070′ B. Here a considerable hole was dug and some ore was found but the hole is now filled up and all the ore has been carried away. This pit is apparently about 300 feet east of the Pocono-Greenbrier contact and the material was evidently obtained in the basal part of the Greenbrier or in the wholly disintegrated or residual soil which covered the locality. Not enough ore was left to take a sample.

PRECIOUS METALS.

TRACES OF ORE.

As explained in many other reports by the writer there is small reason to hope that precious metals like gold, silver, lead, and copper may be found in commercial quantity in any part of West Virginia on account of the virtual absence of igneous rocks and veins of quartz with which such minerals are almost invariably associated either within the veins or in adjacent sands and gravels derived from them. These metals are common in nature and in the rocks of Randolph County there are occasional traces of ore, partly carried into the region in the form of disintegrated fragments of actual ore veins which once existed in the prehistoric mountains of the Piedmont and Atlantic Coast region from which the county sediments came, and partly brought to the surface in tiny fissures of the more disturbed and folded rocks through which some circulation of liquid silica with slightly mineralized solutions could take place. Some digging for precious metals has been done in the county, however, and a careful effort was therefore made to study the results.

The **Martha A. Bright Gold Prospect**, formerly known as the **Granville Dinkle Prospect**, is located in Leadsville District in a ravine entering Horse Run from the north and 0.7 mile northwest of Whyte Station at elevation 1965′ B. Here a considerable hole was dug about 1870 or 1875 into the outcropping black Genesee shale of Upper Devonian age, being now almost entirely filled up and showing only a few tons of material on the dump. According to J. B. Ward, Jr., who kindly guided the writer on his visit to the property, some iron pyrites and a small quantity of nickel were found, together with a three-foot vein of a white material of unknown character. On the dump, as it may now be examined, there are numerous small yellow fragments of iron pyrites and a considerable quantity of white barite crystals some of which are possibly an inch in length and half an inch in diameter. A sample (No. 665R) was collected from these loose crystals, the analysis of which is reported as follows by Kaplan:

	Per cent.
Barium Sulphate ($BaSO_4$)	94.00
Calcium Carbonate ($CaCO_3$)	3.98
Iron Oxide (Fe_2O_3)	1.36
Undetermined	0.66
Total	100.00

This analysis, which shows the undoubted occurrence of barite at the prospect, naturally sheds no light on the percentage of enrichment that may occur in the shales from which it was dug. It is evident, however, that some little quantity was found due to the fact that after an elapsed period of 50 years or more it was still possible to pick up two or three pounds of the ore without a great amount of digging into the dump. Reports of nickel or gold may, of course, be discounted and put aside as of no commercial importance but the evidence regarding barite is worthy of record.

It is not now known to what depth the pit was dug but from the material on the dump it is doubtful if it exceeded 20 feet, evidently in the nature of a square pit or a well. Its location is about one-third mile east of the axis of the Deer Park Anticline, the southeastward dip of the shale being about 15°, and it is almost directly opposite the apparent top of the dome which marks the highest part of the anticline. Apparently the Genesee-Portage contact is about 300 feet east of the prospect and on slightly rising topography.

It would appear that the presence of barite in these shales is due to circulating waters from considerable depth in which the mineralized solutions of pyrite and barite were carried, the action possibly taking place along with the fracturing and gradual upheaval of the strata when the anticline was formed. If this is its actual history it is not without reason to hope that similar mineralization may have taken place at other points on the dome but at the same time it is also true that a very considerable amount of core drilling or even more expensive prospecting will be required to determine whether the occurrence is of commercial size or merely a freak of nature.

The **Western Maryland Railway Gold Prospect** is located in Leadsville District at the northern end of a loop of the Durbin Branch 0.6 mile east of Canfield Station at elevation 2180′ B. Here the Chemung rocks are dipping eastward at an angle of 20° and there is a small vertical fissure trending about due north and south and crossing the tracks, but apparently mostly filled with disintegrated clay from the country rock and containing little, or no, evidence of quartzitic intrusion. According to Mr. George W. Isner, a resident, the contractors who built the railroad carried away five or six sacks of supposed gold, silver, and lead ore dug from about the level of the subgrade. Mr. Isner also secured some of the ore, according to his own statement, and had it analyzed with a report that it contained gold, silver, and lead to the value of $30 per ton. Mr. Isner, unfortunately, had preserved no specimens of the material and did not have the analysis at hand. The writer made a careful inspection of this locality but was unable to find any ore.

The **H. B. Evans Gold Prospect** is located in Leadsville District at the eastern end of Leading Ridge at the head of a ravine of Laurel Fork of Chenoweth Creek one mile north of Hart School and about 3½ miles southeast of Elkins at elevation 2675′ B. According to Mr. Evans the hole was dug to a depth of 20 or 25 feet by Sylvanus Kyle who found considerable iron pyrites and also a little lead and gold. This hole is now filled up and covered over by a barn, but a few samples of the supposed ore were found, consisting of green Chemung rock with tiny veinlets of quartz but without visible mineral. The outcropping rock is Chemung with a general southeast dip.

The **Sylvanus Kyle Heirs Lead Prospect** is located on the same branch of Laurel Run as the Evans prospect, 0.7 mile north of Hart School and about four miles southeast of Elkins at elevation 2305′ B., being also in the Chemung rocks which dip eastward. The hole is now filled up but, according to Mrs. Kyle, a little lead was found. The writer was unable to find any trace of ore.

The **Woodford Run Lead Prospect** is located in Dry Fork District on the north side of Woodford Run of Laurel Fork of Cheat two miles northeast of Alpena and about 0.2 mile east of the secondary road which follows the Pocono-Greenbrier shelf. According to Ralph Ray, who guided the writer to this locality, a chunk of lead from this point was once showed to him by Seymour Wyatt (now deceased). According to Mrs. Coberly, mother of Thomas Coberly of Bowden, and a pioneer resident of this region, she and her deceased husband formerly saw lead when hunting ginseng at this locality. The writer, in company with Mr. Ray, made a diligent search but failed to find lead. At this point the country rock is Catskill dipping westward toward Shavers Mountain.

The **Shelton Reger Gold Prospect** is located in Dry Fork District on the Pocono-Greenbrier shelf 1.3 miles southeast of Dry Fork village and 0.3 mile southwest of Big Run of Red Creek at elevation 2675′ B. Here, according to Mr. Reger, who kindly guided the writer to the locality, a shaft was sunk in 1883 and 1884 to a depth of about 100 feet on the land of Archibald Bonner, now owned by Isom Harper. This shaft starts at the Pocono-Greenbrier contact, and, judging from the material on the dump, probably did not penetrate below the base of the Pocono. There was also an open cut made into the base of the Greenbrier along the sloping hillside just south of the shaft. In this cut it was reported that a thin vein of copper was found and it was also reported that chunks of lead had been washed out of a limestone spring near the cut. At present there are chunks of limestone on the old dumps containing quartzitic inclusions with small specks of lead and with some iridescent luster that may be caused by the presence of copper. This prospect produced no commercial ore and the material was evidently too lean to be worth a chemical analysis.

FORESTS.

ORIGINAL TIMBER CONDITIONS.

Before lumber operations began in Randolph County, the land was almost completely covered with a dense forest. The valley lands along Tygart River, Leading Creek, Elk River, and Dry Fork principally grew poplar, black walnut, oak, and possibly cherry. In the foothills of Tygart Valley, along the northern part of Rich Mountain west of Tygart Valley, in the Laurel Ridge country, in the low hill country of Roaring Creek District, in the Buckhannon River drainage, in the Point Mountain country, and on Back Fork of Elk, the timber was principally hard wood, including oak, chestnut, beech, and maple. In the high mountain lands, including the head of Middle Fork River, the southern part of Rich Mountain west of Tygart Valley, the Gauley Mountain, McGowan Mountain, Cheat Mountain, Shavers Mountain, Middle Mountain, Rich Mountain west of Dry Fork, Little Middle Mountain, Roaring Plains, and Allegheny Mountain countries, soft wood, including hemlock and spruce, predominated, with a considerable amount of birch. The upper valleys of Glady, Laurel, and Dry Forks also contained much hemlock and birch.

PRESENT TIMBER CONDITIONS.

At present the virgin timber of the county is almost entirely gone, the principal remaining areas being on the headwaters of Middle Fork River where a few thousand acres still stand, and in the Gauley Mountain country south of Elk River. Both these areas are under exploitation and will soon be gone.

The best agricultural lands, like Tygart Valley, the valley of Leading Creek, the immediate valleys of Elk River and Dry Fork of Cheat, and the Greenbrier and Mauch Chunk outcrops, are principally cleared and devoted to agriculture and grazing. Certain areas like the Roaring Plains, Allegheny Mountain, Middle Mountain, and the valleys of Laurel and Glady Forks are now almost wholly barren, except for a scrub growth of bastard wild cherry, birch, and brambles. Some of the hard wood areas, however, have developed a considerable second growth of valuable young timber similar to that which originally stood. On the upper waters of Shavers Fork above Bemis, reforestation is in active progress and there is a splendid growth of young spruce.

NATIONAL FORESTS.

As indicated by Maps I and II almost all of Dry Fork District and parts of Leadsville and New Interest Districts are included within the purchase area of the Monongahela National Forest. According to the report of the National Forest Reservation Commission for the period ending June 30, 1929, the areas in West Virginia contemplated or already purchased and assigned to this forest are as follows:

County.	Purchase Units. Acres.	Approved for Purchase. Acres.	Acquired. Acres.
Grant	43,700	6,661	10
Pendleton	149,500	30,969	28,645
Pocahontas	74,900	50,018	30,731
Randolph	183,100	85,937	69,036
Tucker	202,700	65,380	54,429
Totals	653,900	238,965	182,851

It is evident from the above figures that the purchase of lands in Randolph County is slightly more than one-third completed. The headquarters of this forest are at Elkins, in charge of Mr. C. L. Perkins, Supervisor. Under his direction a large scheme of reforestation, principally from stock supplied by the Parsons Nursery, is in active progress near the common corner of Randolph, Pocahontas, and Pendleton Counties, and many trails and roads have been under construction.

FOREST PROTECTION SERVICE.

Growing forests are protected partly by the United States Forest Service, partly by the West Virginia State Game and Fish Commission, and partly by private assessment voluntarily paid on a per-acre basis by landowners. Lookout stations are maintained by the U. S. Forest Service at Mozark Mountain, Tucker County, Spruce Mountain, Pendleton County, and Smoke Camp Knob, Pocahontas County, all of which overlook most of the Randolph territory. Certain others, farther west, are maintained by the State and by private landowners. These stations are manned during the spring and fall seasons and ranger service is also employed.

LUMBER MILLS.

The production of lumber has been a staple industry in Randolph County since 1822, or thereabouts, when a mill was built on the H. C. Tolley place near Valley Head. According to A. B. Brooks, former State Forester, timber was principally removed between 1865 and 1895 by floating the logs down the rivers, but in 1878 a steam sawmill was built on Dry Fork. After the entrance of railroads into the county in 1889, the shipment of logs by water practically ceased and many band mills were built, the industry apparently having its greatest activity between 1900 and 1915.

At present there are still a few band mills in operation and there are numerous portable mills operating on wood lots and small or second-growth tracts.

Moore-Keppel & Company.—Moore-Keppel & Company, of Ellamore, have operated a mill at Ellamore on Middle Fork River since 1906, together with a standard-gauge railroad extending up Left Fork of Middle Fork River to the vicinity of Adolph. Detailed figures on capacity of mill, output, and working force were not secured.

Croft Lumber Company.—The Croft Lumber Company operates a mill at Suncrest on Buckhannon River below Pickens, with a three-foot gauge railroad extending into Webster and Upshur Counties. Details of operation were not secured.

Ranwood Lumber Company.—The Ranwood Lumber Company operates a mill at Pickens, with a three-foot gauge railroad extending into the waters of Sugar Creek. Details were not secured.

Wilson Lumber Company.—The Wilson Lumber Company, with head office at Elkins, West Virginia, operates a mill at Mill Creek in Tygart Valley. According to Mr. Merritt Wilson, President, this plant was originally installed by Hench, Dromgold, and Schull in 1898 or 1899 and was acquired by the present company in 1911. Hardwood lumber is manufactured at the rate of 10,000,000 feet per year, the product going mostly to the general trade. The plant includes a single band mill with planing mill and resaw outfit in connection, sawdust and shavings being used for fuel and the slabs being made into dimension stock and plaster laths. The Valley River Railroad, a three-foot gauge line, previously described on pages 6-7, and operated by the same financial interests under a separate charter, brings timber from the head of Tygart Valley to the mill. In 1926 approximately 175 men were employed in the mill, in the woods, and on the railroad.

R. Chaffey Mill.—In 1926, Mr. Richard Chaffey, of Elkins, West Virginia, had in operation a circular sawmill of 20,000 feet daily capacity at Glady, the same having been built by the Glady Manufacturing Company in 1912 but acquired by Mr. Chaffey in 1925 after the original plant had been burned, according to E. E. Thompson, Superintendent. Timber was being brought to the mill from the head of Laurel Fork by a private standard-gauge railroad owned by Mr. Chaffey, as already described on page 7. Present information is that both the railroad and the mill have now been removed, following exhaustion of available timber.

Spears Lumber Company.—From 1894 until 1928 or 1929, a lumber mill has operated at Horton, the last owner being the Spears Lumber Company of which S. T. Spears, of Elkins, was President. According to newspaper report this company acquired the plant from the Whitmer-Parsons Pulp and Lumber Company in March, 1927. This plant, which was visited by the writer in October, 1926, was originally built by the Condon-Lane Boom & Lumber Company, being succeeded by the Whitmer-Lane Company, followed by the Parsons Pulp & Lumber Company and in 1922 by the Whitmer-Parsons Pulp & Lumber Company, according to H. W. Kelly, Clerk. In 1926 the mill was mostly manufacturing hardwood lumber and by-products, including laths, squares, and pulp wood, the timber being brought from the waters of Seneca Creek, Pendleton County, on a private standard-gauge railroad operated by the same company but later acquired by Spears Lumber Company as already described, page 9. The plant consisted of a single band and resaw mill of 35,000 feet daily capacity. The pay-roll included 45 men at the mill, 90 men in the woods, and 20 men on the railroad. After acquisition by the Spears interests, some additional railroad was built to the southern side of Spruce Knob. It is now reported that the timber has been exhausted and the entire operation discontinued.

CHAPTER XIII.

CLAY, BUILDING STONE, ROAD MATERIALS, AND GLASS-SAND.

CLAYS AND CLAY INDUSTRY.

PRESENT DEVELOPMENT, CLAY INDUSTRY.

Although having a large amount of clay and shale suitable for the manufacture of brick and other clay products, these materials have been only slightly exploited in Randolph County. In 1926 only one plant of this character was in operation.

Elkins Brick Company.

The Elkins Brick Company, of Elkins, West Virginia, operates a plant just northwest of Elkins Junction and about 1.3 miles southwest of the center of Elkins. This concern started business in 1901 on the present site of the Randolph Planing Mill just east of Scott Hill in South Elkins, but a few years later was removed to its present location. According to J. A. Smith, Assistant Foreman, its product consists of common building brick and hollow building blocks (building tile), the previous manufacture of drainage tile having been abandoned. The equipment includes a Bucyrus Brick Machine, 6 circular up-draft kilns of 75,000 brick capacity, and one circular up-draft kiln of 85,000 brick capacity, together with the usual housing and shipping facilities. The brick are burned 6 to 8 days and the tile 5 to 6 days, the product being a pale-red color. Pittsburgh Coal from Braxton County is used for fuel. Shipping facilities are afforded by the Western Maryland Railway. Many buildings in and around Elkins have been built from this brick and most of the streets in Elkins are paved with it.

The raw material is obtained from an adjacent ridge of Portage shale of Upper Devonian age, the same being dark-gray, fissile, and sandy, dipping southeastward at an angle of about 35°, and the quarry having dimensions of about 200 by

200 feet, with a depth of 40 feet, and with a cover of three feet of river clay.

A sample (No. 657R) was collected for analysis from this pit but was unfortunately lost when the laboratory of the Survey was moved in the summer of 1928. This plant was examined, however, by Dr. G. P. Grimsley soon after it had been moved to its present location, the chemical and physical tests secured by him having been published in Volume III of the Survey, page 204, and doubtless representing present conditions quite well. These tests are as follows:

"A chemical analysis of this shale gives the following:

	Per cent.
"Silica (SiO_2)	58.78
Alumina (Al_2O_3)	22.57
Ferric Iron (Fe_2O_3)	4.13
Ferrous Iron (FeO)	1.40
Magnesia (MgO)	1.00
Lime (CaO)	0.18
Soda (Na_2O)	0.54
Potash (K_2O)	3.15
Water (H_2O)	1.05
Titanium (TiO_2)	1.03
Phosphorus (P_2O_5)	0.35
Loss on Ignition	5.43
Total	99.61

"**Physical Properties.**—The shale slakes very slowly and requires 25 per cent. of water to develop its normal molding consistency; the maximum plasticity being 15. Its air shrinkage is three and one-half per cent., and it dries very slowly. The tensile strength is low, 34 to 40 pounds, and if rapidly dried only reaches 10 pounds. The weathered buff shale reaches 83 pounds tensile strength.

"It vitrifies at cone 1 (2102° F.), with a fire shrinkage of 10 per cent., and is red in color. At cone 5 (2246° F.), it becomes black, but not viscous. This shale is greatly improved by weathering and it would be profitable to break down larger masses and leave them exposed to the action of the weather, aided by watering from time to time."

AVAILABLE CLAY AND SHALE.

Residual Clay.

Residual clay, which is derived from weathered rocks and shales and still remains at its original location, may be found at many points in the county, and some of it could be used for making common building brick or drainage tile, but material of this sort often compares unfavorably with bedded deposits and is usually of more value for agricultural soil than for ceramic use. Probably the best of these deposits are to be found along the outcrop of the Mauch Chunk Series of Mississippian age, and the Catskill, Chemung, and Portage Series of Devonian age. Residual clay also occurs in large quantity along the Greenbrier Series but would probably be too calcareous for ceramic use. No tests of residual clay were made.

Transported Clay.

Along the valley of Tygart River, at numerous points from the Rich Mountain gap southward to Beverly and beyond, there are extensive deposits of a gray, finely divided clay, evidently derived in part from material which has weathered from the immediately adjacent mountains but probably in greater part carried northward by the river from more southern localities and being at all points the weathered remnants of argillaceous and siliceous material from the entire stratigraphic cross-section of the valley walls.

This clay was examined on the land of **N. Phay Taylor** on the eastern side of the river 2.2 miles southwest of Elkins and 0.4 mile north of the mouth of Chenoweth Creek. Here it appears to start at low-water level or below and extends up the river embankment five feet, being then covered by two feet of soil and humus. This soil, however, apparently thickens to 5 or 10 feet a little way from the river, making a greater cover on the clay. Beneath the soil the clay has a light-gray color and appears to be quite plastic and finely divided. A sample (No. 668R) was collected from the clay in the river bank at this point the analysis of which, according to Kaplan and Sigwart, is as follows:

	Per cent.
Silica (SiO_2)	69.83
Ferric Iron (Fe_2O_3)	6.18
Alumina (Al_2O_3)	13.80
Lime (CaO)	----
Magnesia (MgO)	0.83
Loss on Ignition	6.92
Undetermined	2.44
Total	100.00

It is apparent from the above analysis that the iron content would cause this clay to burn red when fired in a kiln. It would also appear that the plasticity would be somewhat improved by a higher percentage of alumina but probably this factor is somewhat compensated by the finely divided state of the material. This clay would make common building brick, building tile, or drainage tile, being apparently best suited for the latter purpose.

In the cut of the Huttonsville Branch of the Western Maryland Railway slightly north of the Taylor residence and just south of Sullivan, the following exposure is visible:

		Feet.
1.	Soil and clay, partly yellowish-brown and partly light-gray (1990′ B.), 10′ to	15
2.	Shale and sandstone, bedded (Portage age), to railroad grade	15

At this exposure, which represents a terrace clay the base of which is 75 feet above Tygart River and therefore distinct from the deposit previously described, there appears to be an area of about 20 acres which is covered only by a thin coating of soil. It is evidently the Second Terrace of Tygart River.

At the sharp western bend of Tygart River half-way between Burnt Bridge and Dailey, the First Terrace, or second bottom clay, was once used at the old **Currence Brick Yard,** now the property of **John Weese.** At this locality the river has an elevation of 1945′ B., the first bottom being 7 feet higher at elevation 1952′ B., and the second bottom, or First Terrace, being 27 feet above the river at elevation 1972′ B. Brick from this yard, some of which is still visible in an adjacent farmhouse, burned to a pale-red color. The clay is gray and comminuted, or finely divided, with an undetermined thickness but probably totaling several feet. A sample (No. 741R) collected at this point shows the following analysis according to Kaplan and Sigwart:

	Per cent.
Silica (SiO_2)	73.18
Ferric Iron (Fe_2O_3)	3.54
Alumina (Al_2O_3)	14.30
Lime (CaO)	----
Magnesia (MgO)	0.79
Loss on Ignition	6.20
Undetermined	1.99
Total	100.00

This clay principally differs from the first bottom clay at the Taylor farm in its iron content, the alumina being much the same. Both clays, however, have enough iron to make the product burn red.

On the State road just northeast of Dailey, the second bottom (First Terrace) clay is well exposed at the residence and on the land of **Norman B. Wamsley** where it is gray and plastic, finely divided, and having a reported depth of 8 or 10 feet although the visible exposure at the roadside is somewhat less. A sample (No. 742R) collected at this point shows the following analysis, according to Kaplan and Sigwart:

	Per cent.
Silica (SiO_2)	66.08
Ferric Iron (Fe_2O_3)	4.23
Alumina (Al_2O_3)	17.57
Lime (CaO)	0.52
Magnesia (MgO)	0.81
Loss on Ignition	8.94
Undetermined	1.85
Total	100.00

This clay is slightly higher in alumina and therefore slightly more plastic than the Taylor and Weese samples. A very large amount is visible in road cuts and other exposures about the Weese and Wamsley properties. It is evident that if profitable commercial use could be found for clay of this sort a very great supply could be obtained in Tygart Valley between Elkins and Dailey.

As indicated in the table showing "Terrace Deposits along Tygart River", page 37, it is apparent that transported river clay frequently occurs not only on the First Terrace but also on the Second Terrace. On higher terraces it is not evident that much clay now remains in position, although it was occasionally noted in association with gravel and boulders.

On the other principal rivers of the county, the flood-plain and terrace clays are much more sandy and more mixed with gravel and boulders. Isolated deposits of fairly clean clay might be found at some localities along these streams but in general the visible exposures do not have a hopeful aspect.

Stratified Shales.

Stratified shales, composed principally of silica and alumina, with a variable content of ferric iron and other minor substances, and having the necessary plasticity for molding into brick or tile shapes, occur in great abundance at many localities in the county. In the Allegheny and Pottsville Series, however, with a few exceptions, the shales are principally too carbonaceous or too sandy for ceramic use. In the Mauch Chunk Series there are red or green shales in the Bluestone, Hinton, and Bluefield Groups that are entirely suitable for making good grades of building brick, building tile, and drainage tile, and a mere glance at Map II will show that these beds are within easy reach of transportation at many points. In Chapter VII, the following analyses of Mauch Chunk clays have been published:

Coney Shale: Sample No. 693R, Davis & Elkins land on Point Mountain west of Monterville; page 297.
Indian Mills Shale: Sample No. 696R, Davis Coal Land Company land on Shavers Fork near Flint; page 301.
Lillydale Shale: Sample No. 653R, Gates & Bailey land at Aggregates; page 313; Sample No. 686R, F. P. Marshall Heirs near Mace; page 313; Sample No. 697R, Sylvanus Vandevender land near Bowden; page 314.

These analyses, without exception, show that the shales would burn to a rich red color on account of the presence of ferric iron in considerable quantity. The Lillydale Shale often contains considerable carbonaceous and calcareous matter both of which would be objectionable. Besides the shales actually tested there are many others that are similar to the Coney and Indian Mills in quality and quantity.

In the Catskill Series of the Devonian there are many red and green shales, as shown in the measured sections of Chapter V and the descriptions of Chapter VIII, which would be quite suitable for building brick, building tile, and drainage tile. Most of these are entirely free from carbonaceous or calcareous matter but care must be exercised to avoid beds which would have excessive silica and which would therefore lack plasticity. A sample (No. 690R), collected on the land of Isaac Painter on Ralston Run west of Valley Head, is published on page 360.

In the Chemung and Portage Series of the Devonian there are many beds of shale which are sufficiently argillaceous to be molded into brick and tile shapes as is done with the shales of the latter series at Elkins. These beds have little carbonaceous or calcareous matter and hence the item of plasticity and freedom from sandstone flags is one of the most important considerations.

In the Genesee Series of the Devonian there is abundant shale but it is black and carbonaceous or bituminous and might have too much shrinkage for successful use. Careful tests in this particular would be required before building a plant. In the event that this shale should be used for the distillation of oil, which is a remote possibility, it would appear that the spent shale could be used for brick or tile to good advantage, as the ingredients which would cause shrinkage in the kiln would have been mostly removed.

Fire Clay.

Fire clay, in the restricted sense of a highly refractory material suitable for fire brick or furnace linings, has not been observed in quantity in the county. In the Allegheny and Pottsville Series there are many light-colored underclays beneath the coals, most of which have been called fire clay shales from their resemblance to true fire clays. These shales are generally only a few feet thick and often contaminated with carbonaceous matter which would be accentuated in mining on account of mixture with the overlying coal. Most of these shales, also, would probably contain potash, iron, and other fluxes, which would bar them from use as refractory material, although no samples were taken to determine this point.

In Upshur County, along Buckhannon River near Imperial, Ours Mill, and Beans Mill, there are some flinty fire clays in the lower part of the Allegheny and upper part of the Pottsville Series, as previously noted and described in the Barbour, Upshur and Western Portion of Randolph Report, pages 757-759. These clays contain a considerable amount of fluxing material but would make a good grade of building or paving brick or sewer tile. There is, of course, a considerable possibility that prospecting in the adjacent portion of Randolph County might find them.

BUILDING STONE.

QUARRIES.

In Chapters V-VIII, inclusive, dealing with the stratigraphy of the rocks, the few sandstone quarries of the county have been described, and in Chapter XI, devoted to Limestone, the limestone quarries have been noted. Reference to any of these quarries may be had by consulting the Index at the end of this Report where the items are listed under "Sandstone Quarries" and "Limestone Quarries", respectively, making further recapitulation unnecessary.

AVAILABLE STONE.

The sandstones of the county vary from flaggy and shaly beds that are not sufficiently durable to be used as building stone to great massive ledges, 50 to 150 feet in thickness, that will split into any desired size. In the Allegheny and Pottsville Series there are several coarse sandstones that would afford local material of a durable nature for use in present or prospective mining towns of the coal basins and that have already furnished acceptable building stone in and around Elkins. In the Mauch Chunk Series there are many sandstones but most of them are too shaly or flaggy for use. In certain localities, however, such ledges as the Princeton, Stony Gap, and Webster Springs would furnish a fair grade of stone, as previously noted in Chapter VII. In the Greenbrier Series the sandstones would not be good and the limestones mostly have an irregular fracture that would make them difficult of adaptation for building stone. In the Maccrady Series the few visible sandstones are shaly and worthless and in the Pocono the ledges are often shaly or cross-bedded, but in some localities an acceptable reddish-brown stone for local purposes might be obtained from the Broad Ford Sandstone.

In the Devonian most of the sandstones of the Catskill are shaly and cross-bedded but at selected localities some of them might be used for local stone and the reddish-brown color would give a pleasing architectural effect. In the Chemung Series the siliceous beds are mostly flagstones that would have only limited use but at various localities the Hendricks Sandstone, at the top of the series, becomes massive and would be durable. In the Portage Series there are many flagstones but near the base there are more massive beds. These heavier beds, however, do not appear to have the same firm and durable character as the flagstones and the stone might disintegrate on exposure. In the Genesee Series there are no sandstones.

On the following pages, under the subject of "Road Material", will be found a table indicating the principal sandstone beds worthy of attention from a building standpoint, together with the necessary references to their detailed descriptions.

ROAD MATERIALS.

RIVER AND CREEK GRAVEL.

Attention has been called in previous Reports of the Survey to the fact that many of the rivers and creeks of the State contain an abundant supply of gravel, which, being the more resistant portions of the rocks from which they came, afford good and cheap material for improving roads. These gravels can be used to good advantage in the improvement of muddy sections of secondary roads where a hard surface may be too expensive, and they may also be used as the aggregate for concrete paving and structures.

The best gravels of the county are those which come from the Chemung and Portage rocks and these gravels so derived may be found in abundance along the transverse tributaries of Tygart River above Elkins, of Leading Creek, and of Shavers Fork between Lumber Station and the Tucker County line.

SAND.

Sand, which is another essential material needed in road building, both in masonry construction and in concrete, is found generally along the rivers and creeks of the county, being derived mainly from the arenaceous rocks of the Allegheny and Pottsville Series. These deposits are locally visible and need no elaborate description.

So far as observed the terrace deposits of Pleistocene age do not offer extensive beds of good clean sand, as most of them have too much silt or clay. On some of the higher terraces, there may be localities where these objectionable ingredients may be mostly weathered out.

Sand of a better quality for construction purposes than that found along the rivers could be obtained at considerably higher cost by crushing it from the sandstone ledges of the Allegheny and Pottsville Series, and in rare instances some of these have been weathered so that quantities can be gathered from the outcrops. Such sand, either artifically crushed from stone or naturally weathered into residual pockets, is much more clean and sharp than is the case with transported material.

LIMESTONE.

The limestones of the county are by far its most valuable road material. These limestones, in so far as they appear worthy of use for road construction, have been described as follows in this Report:

Name of Limestone.	Pages on Which Described.
Glenray	Pages 311-12 of Chapter VII, and pages 681 and 701 of Chapter XI.
Alderson	Pages 324-7 of Chapter VII, and pages 682 and 701 of Chapter XI.
Union (Gasper portion)	Pages 328-33 of Chapter VII, and pages 682-97 and 701 of Chapter XI.
Union (Fredonia portion)	Pages 328-33 of Chapter VII, and pages 682-97 and 702 of Chapter XI.
Pickaway	Pages 333-4 of Chapter VII, and page 698 of Chapter XI.
Patton	Pages 334-5 of Chapter VII, and pages 698-9 and 702 of Chapter XI.
Sinks Grove	Page 335 of Chapter VII, and pages 699 and 702 of Chapter XI.

BRICK MATERIAL.

As stated on previous pages of this Chapter under the heading of "Stratified Shales", there is an abundance of material that can be made into brick, some of which might be durable enough for road surfacing, provided a subgrade of concrete be built to take up the shock of traffic. It is not probable, however, that the local materials would make as good paving blocks as the fire clays of more northern counties.

STONE FOR MASONRY, MACADAM, AND CONCRETE.

As stated on pages 805-6, under the subject of "Building Stone", there are many sandstone ledges in the county that can be used for general masonry construction, as well as for concrete aggregate if limestone or gravel is not locally available. Sandstone is not ideal for macadam and with the great amount of available limestone there would appear to be little necessity for its use as such, but if desired the Upper Connoquenessing, Upper Raleigh (Sharon), Princeton, and Hendricks Sandstones at some localities would provide durable material.

The following table gives a list of the principal sandstones that would prove suitable for quarrying, together with references to the pages on which they have been described, those printed in full-faced type having already been used in masonry construction in the county:

Table of Sandstones Available for Masonry Construction.

Name of Sandstone.	Geologic Series and Group.	Approximate Thickness. Feet.	Pages on which Described.
Upper Mahoning	Conemaugh	20 to 30	219
Lower Mahoning	Conemaugh	20 to 45	219
Upper Freeport	Allegheny	20 to 30	227
Lower Freeport	Allegheny	20 to 50	228
Upper East Lynn	Allegheny	30 to 50	229-30
Homewood	Pottsville—Kanawha	25 to 60	240-1
Upper Connoquenessing	Pottsville—Kanawha	50 to 100	242-4
Lower Connoquenessing (Lower Winifrede?)	Pottsville—Kanawha	20 to 35	245
Upper Cedar Grove	Pottsville—Kanawha	20 to 25	247
Peerless	Pottsville—Kanawha	10 to 50	248
Monitor	Pottsville—Kanawha	0 to 25	249
Brownstown	Pottsville—Kanawha	10 to 50	250-1
Eagle	Pottsville—Kanawha	25 to 50	252
Decota	Pottsville—Kanawha	10 to 20	253-4
Lower Gilbert	Pottsville—Kanawha	25 to 50	255
Upper Nuttall	Pottsville—New River	10 to 50	258-9
Lower Nuttall	Pottsville—New River	25 to 50	260
Harvey	Pottsville—New River	15 to 50	263
Guyandot	Pottsville—New River	10 to 50	264-5
Lower Guyandot	Pottsville—New River	10 to 20	269-70
Upper Raleigh (Sharon)	Pottsville—New River	25 to 60	272-4
Princeton	Mauch Chunk—Princeton	15 to 50	288-9
Stony Gap	Mauch Chunk—Hinton	20 to 50	295-6
Webster Springs	Mauch Chunk—Bluefield	20 to 50	307-10
Hendricks	Chemung	25 to 75	368-71

GLASS-SAND.

PRESENT DEVELOPMENT, GLASS-SAND INDUSTRY.

Only slight attempt has been made to develop a glass-sand industry in Randolph County. In 1904 the **Enterprise Silica Sand Company**, of Bellaire, Ohio, built a glass-sand plant at Silica Station, on Buckhannon River below Pickens, but it was soon abandoned and dismantled. The Homewood Sandstone was quarried and doubtless its pebbly nature led to the stoppage of operation.

In the edge of Upshur County the same Homewood Sandstone was once quarried for glass-sand at Craddock by the **Silica Sand Company** but this plant was also abandoned. In the same county a ledge which was provisionally termed the East Lynn in the Barbour, Upshur and Western Randolph Report, pages 136 and 761, but which now appears to be the same as the Upper East Lynn of the present Report, has been quarried for glass-sand by the **Imperial Sand Company** on Buckhannon River between Tenmile and Beans Mill, Upshur County.

POSSIBLE SOURCES OF GLASS-SAND.

The usual requirements of a homogeneous medium-grained sand free from pebbles and with only a slight content of iron and other impurities, together with easy quarrying and shipping facilities, appear to be seldom, if ever, met by the sandstone ledges of Randolph County. It is possible that some portions of Middle Fork District may have exposures of Upper East Lynn Sandstone similar to the occurrence at Imperial, where it has 99.43 per cent. of silica and where it is practically free from pebbles.

The Homewood Sandstone, at various localities, would be low enough in iron to make glass but it is nearly always pebbly and careful selection of quarry sites would therefore be essential. A sample was once collected from this ledge on the land of **S. C. Degarmo** near his residence just west of Arvondale Junction, having the following analysis (unwashed) according to former chemists of the Survey:

	Per cent.
Silica (SiO_2)	99.18
Ferric Iron (Fe_2O_3)	0.12
Alumina (Al_2O_3)	0.11
Calcium Carbonate ($CaCO_3$)	0.11
Magnesium Carbonate ($MgCO_3$)	0.28
Loss on Ignition	0.20
Total	100.00

Such a sand would make good glass but quarry sites would be difficult to find on account of the pebbles.

There is some possibility that the Guyandot and Lower Guyandot Sandstones of the Pottsville, both of which are sometimes nearly white and practically free from pebbles, might produce acceptable glass-sand but unfortunately no samples were taken from these ledges. As previously discussed in Chapter VI, prominent outcrops of either or both are found on Middle Fork River near Cassity, on Mill Creek, and on Shavers Fork of Cheat.

At the eastern end of Point Mountain, the Droop Sandstone, of Mauch Chunk age, is a white and massive ledge on the land of **Webster Stalnaker,** 1.5 miles northwest of Monterville, as described on page 302. Here the stone is free from pebbles and weathers easily to a clean, white sand but when the ledge was sampled it proved to have only 95.08 per cent. of silica and an iron content of 3.78 per cent. Whether this iron could be washed out is unknown.

PART IV.

Paleobotany and Paleontology.

CHAPTER XIV.

PALEOBOTANY.

INTRODUCTION.

As previously stated in this Report, Dr. David White, Principal Geologist, United States Geological Survey, and one of the foremost authorities on paleobotany in the world, most graciously spent considerable time with the writer in Randolph County in the examination of Pennsylvanian, Mississippian, and Devonian fossil plants. Most of his time, however, was devoted to the peculiar and very interesting evidences of plant life in the Upper Devonian, although several collections were also made in the New River Group of the Pottsville Series of the Pennsylvanian and some little attention was paid to the Mississippian.

It has not been possible for Dr. White to complete his study of the collections in time for publication in this Report, either in preliminary or final form, and hence the writer undertakes to indicate the work accomplished to date and to summarize such identifications as were made in the field. Naturally, Dr. White can scarcely be held accountable for incomplete lists and most especially should not be quoted as authority for such collections as were made by the writer in his absence. It is considered, however, that this work, even in its partial state of completion, may be of some interest and value.

In Randolph County or closely adjacent territory 13 plant collections were made in the Pottsville Series of the Pennsylvanian, 6 in the Mauch Chunk of the Mississippian, 2 in the Greenbrier Series of the Mississippian, 11 in the Catskill Series of the Devonian, 16 in the Chemung Series of the Devonian, and 5 in the Portage Series of the Devonian.

In Chapters V, VI, VII, and VIII, dealing with stratigraphy, these various collections have been mentioned and in most cases the stratigraphic associations are clearly shown. For the stratigraphic work the writer takes full responsibility.

LIST OF FOSSIL LOCALITIES.

In the following memoranda there is published a List of Fossil Localities, including not only the plant collections made by Dr. White and the writer, but also the marine invertebrate collections made by the writer and delivered to Dr. John L. Tilton of the West Virginia Geological Survey for identification and comment, as will be presented by him in Chapter XV. This latter work, fortunately, was completed in ample time for publication.

On Map II the exact locality and lot number of all collections within the area of the map are engraved in red, making easy the identification of these points in case other investigators desire to study them in more detail.

It has not been possible to prepare illustrations and figures of either plant or marine fossils for these two Chapters but elsewhere in the text of this Report will be found various half-tone views of some of the more interesting Devonian plant exposures.

LIST OF FOSSIL LOCALITIES, RANDOLPH COUNTY.

Lot 302.—Marine fossils from Gasper portion of Union Limestone of Greenbrier Series in Greenbank District, Pocahontas County, on Shavers Mountain just west of Staunton and Parkersburg Pike 2 miles northwest of Durbin; elevation, 3377′ B.; collected by David B. Reger and referred to Geo. H. Girty at Washington; see No. 17 of Durbin Section, page 169.

Lot 303.—Marine fossils from Alderson Limestone of Greenbrier Series in Greenbank District, Pocahontas County, on Shavers Mountain just west of Staunton and Parkersburg Pike 2 miles northwest of Durbin; elevation, 3450′ B.; collected by David B. Reger and referred to Geo. H. Girty at Washington; see No. 15 of Durbin Section, pages 168-9.

Lot 304.—Marine fossils from Alderson Limestone of Greenbrier Series in Greenbank District, Pocahontas County, along Staunton and Parkersburg Pike 3 miles northwest of Durbin; elevation, 3450′ B.;

collected by David B. Reger and referred to Geo. H. Girty at Washington; see No. 15 of Durbin Section, pages 168-9.

Lot 305.—Plant fossils from Alderson Limestone of Greenbrier Series in Greenbank District, Pocahontas County, along Staunton and Parkersburg Pike 3 miles northwest of Durbin; elevation, 3450′ B.; collected by David B. Reger and referred to David White at Washington; see No. 15 of Durbin Section, pages 168-9.

Lot 309.—Marine fossils from Terry Shale of Hinton Group of Mauch Chunk Series in Beverly District on north side of Fishinghawk Creek 0.7 mile west of Bemis; elevation, 2685′ B.; collected by David B. Reger and referred to Geo. H. Girty at Washington; see Local Measurement in description of Terry Shale, page 290.

Lot 349.—Marine fossils from Gasper portion of Union Limestone of Greenbrier Series in Roaring Creek District, at Gates & Bailey quarry, on south side of Tygart River 0.3 mile southeast of Aggregates; elevation, 1920′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 27 of Aggregates Section, page 150, and also Chapter XV.

Lot 350.—Marine fossils from type locality of Elkins Sandstone of Chemung Series in Leadsville District, along State road on north side of Tygart River 0.6 mile northwest of Buxton and 2.6 miles northwest of Elkins; elevation, 1920′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 65 of Aggregates Section, pages 152-3, and also Chapter XV.

Lot 351.—Marine fossils from lower 50 feet of type locality of Elkins Sandstone of Chemung Series in Leadsville District, in quarry along State road north of Tygart River, 0.6 mile northwest of Buxton and 2.5 miles northwest of Elkins; elevation, 1940′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 65 of Aggregates Section, pages 152-3, and also Chapter XV.

Lot 352.—Marine fossils from Broad Ford Sandstone of Pocono Series in Leadsville District along old Morgantown Pike on east side of Laurel Ridge 5.3 miles northwest of Elkins; elevation, 2545′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 4 of Morgantown Pike Section, pages 153-4, and also Chapter XV.

Lot 353.—Marine fossils from Broad Ford Sandstone of Pocono Series in Leadsville District, in public road north of Saltlick Run of Leading Creek 2.3 miles west of Montrose; elevation, 2305′ B.; collected by David B. Reger and referred to John L. Tilton; see description of Broad Ford Sandstone, page 347, and also Chapter XV.

Lot 354.—Marine and plant fossils from Elkins Sandstone of the Chemung Series in Leadsville District in public road on north side of Craven Run of Leading Creek 3.3 miles northeast of Elkins; elevation, 2155′ B.; collected by David B. Reger and referred to John L. Tilton; see description of Elkins Sandstone, page 375, and also Chapter XV.

Lot 355.—Plant fossils from Saxton Shale of Catskill Series in Dry Fork District, in cut of Western Maryland Railway south of Shavers Fork of Cheat River, 0.3 mile northwest of Meadows Station; elevation, 2195′ B.; collected by David B. Reger and referred to David White; see Local Measurement in description of Saxton Shale, page 358, and also Chapter XIV.

Lot 356.—Marine fossils from Genesee Series in New Interest District, in public road north of Stonespring Run of Leading Creek 1.4 miles northwest of Kerens; elevation, 2005′ B.; collected by David B. Reger and referred to John L. Tilton; see description of Genesee, page 394, and also Chapter XV.

Lot 357.—Marine fossils from the basal 50 feet of Chemung Series in New Interest District in Western Maryland Railway cut on headwaters of Leading Creek 1.5 miles northeast of Montrose; collected by David B. Reger and referred to John L. Tilton; see Local Measurement in description of Chemung, page 381, and also Chapter XV.

Lot 358.—Marine fossils from the lower half, about 700 feet above the base, of the Chemung Series, in Leadsville District, on Loglick Run of Stalnaker Run of Leading Creek 1.9 miles east of Whyte; elevation, 2090′ B.; collected by David B. Reger and referred to John L. Tilton; see description of Chemung, pages 381-2, and also Chapter XV.

Lot 359.—Marine fossils from Elkins Sandstone of the Chemung Series in Leadsville District in road along Chenoweth Creek 0.4 mile east of Hart School and 4.5 miles southeast of Elkins; elevation, 2165′ B.; collected by David B. Reger and referred to John L. Tilton; see description of Elkins Sandstone, page 376, and also Chapter XV.

Lot 360.—Plant and marine fossils from the Saxton Shale of Catskill Series in Beverly District, along Staunton and Parkersburg Pike on east side of Rich Mountain, 3.2 miles northwest of Beverly; elevation, 2715′ B.; collected by David B. Reger and David White and referred to David White; see No. 19 of Beverly Section, page 156, and also Chapter XIV.

No. 361.—Marine and plant fossils from Hendricks Sandstone of Chemung Series in Beverly District along Staunton and Parkersburg Pike on east side of Rich Mountain 2.9 miles northwest of Beverly; elevation, 2565′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 33 of Beverly Section, page 157, and also Chapters XIV and XV.

Lot 362.—Marine fossils in zone 888 to 948′ below top of Chemung Series in Beverly District along Staunton and Parkersburg Pike on east side of Rich Mountain, 2.4 miles northwest of Beverly; elevation, 2360′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 41 of Beverly Section, page 157, and also Chapter XV.

Lot 363.—Marine fossils from zone 1089 to 1114′ below top of Chemung Series in Beverly District, along Staunton and Parkersburg Pike on east side of Rich Mountain, 2.4 miles northwest of Beverly; elevation, 2270′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 43 of Beverly Section, page 158, and also Chapter XV.

Lot 364.—Marine fossils from Elkins Sandstone of Chemung Series in Beverly District along Staunton and Parkersburg Pike near the eastern base of Rich Mountain, 2.4 miles northwest of Beverly; elevation, 2045′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 51 of Beverly Section, page 158, and also Chapter XV

Lot 365.—Marine fossils from Elkins Sandstone of Chemung Series in Leadsville District in State road on branch of Isner Creek at foot of Kelley Mountain 2.5 miles southeast of Elkins; elevation, 2150′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 8 of Kelley Mountain Section, page 155, and also Chapter XV.

Lot 366.—Plant fossils from Elkins Sandstone of Chemung Series in Leadsville District in State road on branch of Isner Creek at foot of Kelley Mountain 2.5 miles southeast of Elkins; elevation, 2150′ B.; collected by David B. Reger and David White and referred to David White; see No. 8 of Kelley Mountain Section, page 155, and also Chapter XIV.

Lot 367.—Plant fossils from upper part of Elkins Sandstone of Chemung Series in Leadsville District in road north of Craven Run of Leading Creek 3.5 miles northeast of Elkins; elevation, 2190′ B.; collected by David B. Reger and referred to David White; see description of Elkins Sandstone, page 375, and also Chapter XIV.

Lot 368.—Plant fossils from lower portion of Portage Series in Valley Bend District in road along east side of Tygart River 1.2 miles southeast of Valley Bend and 0.6 mile southwest of Glade Run School; elevation, 1982′ B.; collected by David B. Reger and David White and referred to David White; see description of Portage, page 390, and also Chapter XIV.

Lot 369.—Plant fossils from the middle (?) of Portage Series in Leadsville District on a branch of Leading Creek 0.3 mile east of Read Station and 2 miles north of Elkins; elevation, 2055′ B.; collected by David B. Reger, J. B. Ward, Jr., and David White and referred to David White; see description of Portage, pages 388-9, and also Chapter XIV.

Lot 370.—Marine fossils from the middle (?) of Portage Series in Leadsville District on a branch of Leading Creek 0.3 mile east of Read Station and 2 miles north of Elkins; elevation, 2055′ B.; collected by David B. Reger and J. B. Ward, Jr., and referred to John L. Tilton; see description of Portage, pages 388-9, and also Chapter XV.

Lot 371.—Marine fossils from Broad Ford Sandstone of Pocono Series in Dry Fork District in bluff north of Shavers Fork of Cheat River just west of Bickle Run and 0.2 mile northwest of Bowden; elevation, 2240′ B.; collected by David B. Reger and referred to John L. Tilton; see Local Measurement in the description of Broad Ford Sandstone, page 348, and also Chapter XV.

Lot 372.—Marine fossils from Alderson Limestone of Greenbrier Series in Dry Fork District in private road west of Taylor Run of Shavers Fork 0.5 mile northeast of Chestnut Grove School and 1 mile east of Bowden; elevation, 2325′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 36 of Bowden Section, page 190, and also Chapter XV.

Lot 373.—Marine fossils from Elkins Sandstone of Chemung Series in Mingo District in cut of Valley River Railroad on east side of Tygart River 0.3 mile north of Spangler; elevation, 2180′ B.; collected by David B. Reger and referred to John L. Tilton; see description of Elkins Sandstone, page 378, and also Chapter XV.

Lot 374.—Plant fossils from type locality of Valley Head Sandstone of Chemung Series in Mingo District in public road along a northern branch of Windy Run of Tygart River 0.2 mile northeast of Valley Head; elevation, 2425′ B.; collected by David B. Reger and David White and referred to David White; see No. 85 of Valley Head Section, page 174, and also Chapter XIV.

Lot 375.—Marine and plant fossils from Saxton Shale of Catskill Series in Mingo District in State road along east side of Tygart River 0.1 mile south of Mingo; elevation, 2690′ B.; collected by David B. Reger and David White and referred to David White; see Local Measurement in description of Saxton Shale, pages 358-9, and also Chapter XIV.

Lot 376.—Marine and plant fossils from Saxton Shale of Catskill Series in Mingo District in mountain road east of Mingo Run of Tygart River 0.1 mile southeast of Upper Mingo; elevation, 2735′ B.; collected by David B. Reger and David White and referred to David White; see No. 67 of Mingo Section, page 179, and also Chapter XIV.

Lot 377.—Marine fossils from Alderson Limestone of Greenbrier Series in Mingo District in State road ascending Point Mountain 0.2 mile southwest of Monterville; elevation, 3020′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 55 of Valley Head Section, page 172, and also Chapter XV.

Lot 378.—Marine fossils from Reynolds Limestone of Bluefield Group of Mauch Chunk Series in Mingo District in State road ascending Point Mountain 0.5 mile northwest of Monterville: elevation, 3110′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 50 of Valley Head Section, page 172, and also Chapter XV.

Lot 379.—Marine fossils from Terry Shale and Limestone of Hinton Group of Mauch Chunk Series in Beverly District, in old railroad grade (now county road), on west side of Shavers Fork of Cheat River 0.6 mile north of Bemis; elevation, 2720′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 45 of Bemis Section, page 161, and also Chapter XV.

Lot 380.—Plant fossils from roof shales of Welch Coal of New River Group of Pottsville Series in Dry Fork District on east side of Shavers Mountain 0.3 mile west of Wheeler, in roof of Coal Prospect No. 413; elevation, 3585′ B.; collected by David B. Reger and referred to David White; see Chapter XIV.

Lot 381.—Plant fossils from pavement under Sewell Coal of New River Group of Pottsville Series, at Coal Prospect No. 377; in Dry Fork District, on east side of Shavers Mountain 0.3 mile west of Wheeler; elevation, 3615′ B.; collected by David B. Reger and referred to David White; see Chapter XIV.

Lot 388.—Plant fossils from Elkins Sandstone of Chemung Series in Mingo District in cut of Valley River Railroad, east side of Tygart River, 0.3 mile northwest of Spangler; collected by David B. Reger and David White and referred to David White; see description of Elkins Sandstone, page 379, and also Chapter XIV.

Lot 389.—Marine fossils from Valley Head Sandstone of Chemung Series in Leadsville District on Kelley Mountain road just southeast of Tunnel Station 3 miles east of Elkins; elevation, 2465′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 6 of Kelley Mountain Section, page 155, and also Chapter XV.

Lot 390.—Plant fossils from Valley Head Sandstone of Chemung Series in Leadsville District on Kelley Mountain road just southeast of Tunnel Station 3 miles east of Elkins; elevation, 2465′ B.; collected by David B. Reger and referred to David White; see No. 6 of Kelley Mountain Section, page 155, and also Chapter XIV.

Lot 391.—Marine fossils from a shale of Bluestone Group of Mauch Chunk Series in Dry Fork District on Middle Point north of Taylor Run 1.8 miles northeast of Bowden; elevation, 3000′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 23 of the Bowden Section, page 189, and also Chapter XV.

Lot 392.—Plant fossils from lower portion of Portage Series in Leadsville District in Coal & Coke Railway cut south of Tygart River 0.5 mile southeast of Buxton and 2 miles west of Elkins; elevation, 1910′ B.; collected by David B. Reger and referred to David White; see description of Portage, page 390, and also Chapter XIV.

Lot 393.—Plant fossils from middle portion of Portage Series in New Interest District in State road east of Leading Creek 0.3 mile south of Kerens; elevation, 2000′ B.; collected by David B. Reger and referred to David White; see description of Portage, page 388, and also Chapter XIV.

Lot 394.—Plant fossils from Elkins Sandstone of Chemung Series in Black Fork District, Tucker County, in road north of Pheasant Run of Shavers Fork 3.8 miles northeast of Kerens; elevation, 1880′ B.; collected by David B. Reger and referred to David White; see description of Elkins Sandstone, page 379, and also Chapter XIV.

Lot 395.—Plant fossils from Elkins Sandstone of Chemung Series in Black Fork District, Tucker County, in bluff east of Dry Fork of Cheat River just north of highway at east end of Parsons; elevation, 1635′ B.; collected by David B. Reger and referred to David White; see description of Elkins Sandstone, page 380, and also Chapter XIV.

Lot 396.—Plant fossils from the type locality of Elkins Sandstone of Chemung Series in Leadsville District in State road north of Tygart River 0.6 mile northwest of Buxton and 2.6 miles northwest of Elkins; collected by David B. Reger and David White and referred to David White; see No. 65 of Aggregates Section, pages 152-3, and also Chapter XIV.

Lot 397.—Plant fossils from type locality of Elkins Sandstone of Chemung Series in Leadsville District in quarry north of State road north of Tygart River 0.6 mile northwest of Buxton and 2.5 miles northwest of Elkins; collected by David B. Reger and David White and referred to David White; see No. 65 of Aggregates Section, pages 152-3, and also Chapter XIV.

Lot 398.—Plant fossils from middle portion of Portage Series in Leadsville District on Sugar Run of Leading Creek 1 mile northeast of Read Station and 3 miles north of Elkins; collected by David B. Reger and David White and referred to David White; see description of Portage, page 389, and also Chapter XIV.

Lot 399.—Plant fossils from Valley Head Sandstone of Chemung Series in Black Fork District, Tucker County, in highway cut at mouth of Roaring Run of Dry Fork of Cheat River 0.5 mile northwest of Hambleton; elevation, 1705′ B.; collected by David B. Reger and David White and referred to David White; see No. 20 of Roaring Run Section, page 196, and also Chapter XIV.

Lot 400.—Marine fossils from type locality of Hendricks Sandstone of Chemung Series in Black Fork District, Tucker County, in mountain road just north of Hambleton and 1 mile northwest of Hendricks; elevation, 1800′ B.; collected by David B. Reger and referred to John L. Tilton; see Nos. 3-5 of Roaring Run Section, page 195, and also Chapter XV.

Lot 401.—Plant fossils from Elkins Sandstone of Chemung Series in Black Fork District, Tucker County, in road at Alum Hill west of Cheat River 1 mile north of Parsons; elevation, 1725′ B.; collected by David B. Reger and David White and referred to David White; see description of Elkins Sandstone, page 380, and also Chapter XIV.

Lot 402.—Plant fossils from Elkins Sandstone of Chemung Series in Black Fork District, Tucker County, in road at mouth of Pheasant Run of Shavers Fork 2.2 miles southwest of Porterwood; elevation, 1745′ B.; collected by David B. Reger and David White and referred to David White; see description of Elkins Sandstone, page 379, and also Chapter XIV.

Lot 403.—Plant fossils from Sewell Coal of New River Group of Pottsville Series in Beverly District at Walkers New River Mining Co. Mine on Cheat Mountain west of Shavers Fork 1.2 miles southwest of Flint; elevation, 2936′ B.; collected by David B. Reger and David White and referred to David White; see description of Coal Mine No. 295, pages 607-8, and also Chapter XIV.

Lot 404.—Plant fossils from the Welch Coal of the New River

Group of the Pottsville Series in Beverly District at Walkers New River Mining Co. Mine on Cheat Mountain west of Shavers Fork 1.2 miles southwest of Flint; elevation, 2920′ B.; collected by David B. Reger and David White and referred to David White; see description of Coal Prospect No. 400, page 653, and also Chapter XIV.

Lot 405.—Marine fossils from Hartridge Shale of New River Group of Pottsville Series in Beverly District at Walkers New River Mining Co. Mine on Cheat Mountain west of Shavers Fork 1.2 miles southwest of Flint; elevation, 2936′ B.; collected by David B. Reger and David White and referred to John L. Tilton; see Chapter XV.

Lot 406.—Plant fossils from Welch Coal of New River Group of Pottsville Series in Dry Fork District at Thompson Coal Co. Mine on Shavers Mountain east of Shavers Fork and 1.5 miles northeast of Bemis; elevation, 3220′ B.; collected by David B. Reger and David White and referred to David White; see description of Coal Mine No. 410, page 656, and also Chapter XIV.

Lot 407.—Plant fossils from Hendricks Sandstone of Chemung Series in Mingo District on Seneca Trail on east side of Tygart River 1.6 miles south of Valley Head; elevation, 2530′ B.; collected by David B. Reger and David White and referred to David White; see Local Measurement in description of Hendricks Sandstone, page 370, and also Chapter XIV.

Lot 408.—Plant fossils from roof of Sewell Coal of New River Group of Pottsville Series in Mingo District in State road on east end of Point Mountain 2.1 miles west of Monterville; elevation, 3600′ B.; collected by David B. Reger and David White and referred to David White; see No. 17 of Valley Head Section, page 171, and also Chapter XIV.

Lot 409.—Plant fossils from extreme top of Catskill Series in Mingo District, in State road north of Ralston Run 2.3 miles west of Valley Head; elevation, 2895′ B.; collected by David B. Reger and David White and referred to David White; see No. 67 of Valley Head Section, page 173, and also Chapter XIV.

Lot 410.—Plant fossils from the middle portion of Catskill Series in Mingo District, in State road north of Ralston Run 1.5 miles west of Valley Head; elevation, 2690′ B.; collected by David B. Reger and David White and referred to David White; see No. 73 of Valley Head Section, page 173, and also Chapter XIV.

Lot 411.—Plant fossils from lower portion of Catskill Series in Leadsville District, in State road north of Tygart River 1 mile west of Buxton and 3.1 miles west of Elkins; collected by David B. Reger and David White and referred to David White; see No. 60 of Aggregates Section, page 152, and also Chapter XIV.

Lot 412.—Plant fossils from roof of Sewell Coal of New River Group of Pottsville Series in Roaring Creek District, J. B. Hart Mine, on Rich Mountain, just south of Staunton and Parkersburg Pike 3 miles east of Mabie; elevation, 2860′ B.: collected by David B. Reger and David White and referred to David White; see description of Coal Mine No. 238, page 585, and also Chapter XIV.

Lot 413.—Plant fossils from Elkins Sandstone of Chemung Series in Huttonsville District, on Seneca Trail west of Tygart River 0.3 mile south of Lee Bell; elevation, 2060′ B.; collected by David B. Reger and David White and referred to David White; see description of Elkins Sandstone, page 377, and also Chapter XIV.

Lot 422.—Plant fossils from Graham Sandstone of Bluefield Group of Mauch Chunk Series in Greenbank District, Pocahontas County, in Staunton and Parkersburg Pike on Back Allegheny Mountain 2 miles southeast of Cheat Bridge; elevation, 3640′ B.; collected by David B. Reger and David White and referred to David White; see No. 6 of Durbin Section, page 168, and also Chapter XIV.

Lot 427.—Plant fossils from 50 to 90 feet above base of Catskill Series in Greenbank District, Pocahontas County, in Staunton and Parkersburg Pike just west of West Fork of Greenbrier River just west of Durbin; collected by David B. Reger, Paul H. Price, and David White, and referred to David White; see No. 41 of Durbin Section, page 170, and also Chapter XIV.

Lot 428.—Plant fossils from 190 to 220 feet above base of Catskill Series in Greenbank District, Pocahontas County, in north-south tangent of Staunton and Parkersburg Pike 0.7 mile northwest of Durbin; collected by David B. Reger, Paul H. Price, and David White and referred to David White; see No. 39 of Durbin Section, page 170, and also Chapter XIV.

Lot 436.—Plant fossils from roof of Sewell Coal of New River Group of Pottsville Series in Middle Fork District at mine of Three Fork Coal Co. on west side of Middle Fork River 0.5 mile southwest of Cassity; elevation, 2040′ B.; collected by David B. Reger and referred to David White; see description of Coal Mine No. 260, pages 591-2, and also Chapter XIV.

Lot 437.—Marine fossils from Valley Head Sandstone of Chemung Series in Mingo District in Seneca Trail west of Tygart River 0.5 mile northwest of Spangler; collected by David B. Reger and referred to John L. Tilton; see description of Valley Head Sandstone, page 372, and also Chapter XV.

Lot 438.—Plant fossils from Valley Head Sandstone of Chemung Series in Mingo District in Seneca Trail west of Tygart River 0.5 mile northwest of Spangler; collected by David B. Reger and referred to David White; see description of Valley Head Sandstone, page 372, and also Chapter XIV.

Lot 439.—Plant fossils from just below middle of Catskill Series in Mingo District in State road north of Ralston Run 1.4 miles west of Valley Head; elevation, 2585′ B.; collected by David B. Reger and referred to David White; see No. 75 of Valley Head Section, page 173, and also Chapter XIV.

Lot 440.—Marine (?) fossils from about 150 feet above base of Catskill Series in Dry Fork District in road north of Flannigan Run 0.5 mile southeast of Evenwood; elevation, 2780′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 33 of Evenwood Section, page 193, and also Chapter XV.

Lot 441.—Marine fossils from Hendricks Sandstone? of Chemung Series in Circleville District, Pendleton County, in cut of Spears Lumber Co. R. R. at head of Seneca Creek 1.1 miles northeast of Gatewood and 1.8 miles northwest of Spruce Knob; elevation, 3885′ B.; collected by David B. Reger and referred to John L. Tilton; see description of Hendricks Sandstone, page 370, and also Chapter XV.

Lot 442.—Plant and marine fossils from Bluestone Group of Mauch Chunk Series in Circleville District, Pendleton County, on Spruce Mountain 0.1 mile south of Spruce Knob; elevation, 4795′ B.; collected by David B. Reger and referred to John L. Tilton and David White; see No. 2 of Spruce Knob Section, page 213, and also Chapters XIV and XV.

Lot 443.—Plant fossils from Upper Raleigh (Sharon) Sandstone of New River Group of the Pottsville Series in Circleville District, Pendleton County, on top of Spruce Knob; elevation, 4860′ B.; collected by David B. Reger and referred to David White; see No. 1 of Spruce Knob Section, page 213, and also Chapter XIV.

Lot 444.—Plant fossils from Princeton Conglomerate of Mauch Chunk Series in Circleville District, Pendleton County, on Spruce Mountain 0.1 mile south of Spruce Knob; elevation, 4750′ B.; collected by David B. Reger and referred to David White; see No. 3 of Spruce Knob Section, page 213, and also Chapter XIV.

Lot 445.—Plant fossils from about 300 feet below top of Catskill Series in Dry Fork District in cut of Spears Lumber Co. R. R. on west side of Gandy Creek 0.2 mile southwest of Swallow Rock Run and 3 miles southwest of Horton; elevation, 3070′ B.; collected by David B. Reger and referred to David White; see description of Catskill, page 361, and also Chapter XIV.

Lot 446.—Marine fossils from Saxton Shale of Catskill Series in Greenbank District, Pocahontas County, in Staunton and Parkersburg Pike on Back Allegheny Mountain 1.1 miles northwest of Durbin; elevation, 3120′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 28 of Durbin Section, page 169, and also Chapter XV.

Lot 447.—Plant fossils from Gilbert Coal of Kanawha Group of Pottsville Series in Mingo District at Hopkins Mine of West Virginia Pulp & Paper Co on Cheat Mountain 0.6 mile west of Hopkins; elevation, 4410′ B.; collected by David B. Reger and referred to David White; see Chapter XIV.

Lot 448.—Marine fossils from Terry Shale of Hinton Group of Mauch Chunk Series in Huttonsville District in cut of Western Maryland Railway on east side of Shavers Fork just south of Lambert Run and 1.6 miles southwest of Cheat Bridge; elevation, 3581′ B.; collected by David B. Reger and referred to John L. Tilton; see Local Measurement in description of Terry Shale, page 291, and also Chapter XV.

Lot 449.—Plant fossils from roof of Sewell Coal of New River Group of Pottsville Series in Huttonsville District at Linan Mine of West Virginia Pulp & Paper Co. on west side of Shavers Fork 0.5 mile southwest of Yokum Run and 6 miles north of Cheat Bridge; elevation, 3420′ B.; collected by David B. Reger and referred to David White; see description of Coal Mine No. 318, page 619, and also Chapter XIV.

Lot 450.—Plant fossils from shales 15 feet below Fire Creek Coal of New River Group of Pottsville Series in Valley Bend District in cut of Western Maryland Railway on east side of Shavers Fork 0.2 mile southeast of Stalnaker Run and 5 miles southwest of Cheat Junction; elevation, 3095′ B.; collected by David B. Reger and referred to David White; see description of Coal Prospect No. 424, page 662, and also Chapter XIV.

Lot 451.—Plant fossils from 75 to 100 feet below top of Catskill Series in Greenbank District, Pocahontas County, in Staunton and Parkersburg Pike on Back Allegheny Mountain at road fork 1 mile northwest of Durbin; elevation, 3105′ B.; collected by David B. Reger and referred to David White; see No. 29 of Durbin Section, page 169, and also Chapter XIV.

Lot 452.—Plant fossils from Webster Springs Sandstone of Bluefield Group of Mauch Chunk Series in Mingo District in old road on Point Mountain north of new State road and 0.2 mile northwest of Monterville; elevation, 3080′ B.; collected by David B. Reger and referred to David White; see No. 54 of Valley Head Section, page 172, and also Chapter XIV.

Lot 453.—Plant fossils from Princeton Sandstone of Mauch Chunk Series in Fork Lick District, Webster County, in State road ascending Point Mountain just east of Jonathan Knob 0.6 mile northeast of Ralph and 3 miles northeast of Webster Springs; elevation, 2185′ B.; collected by David B. Reger and referred to David White; see description of Princeton Sandstone, page 288, and also Chapter XIV.

Lot 454.—Plant fossils from Coney Shale just below Stony Gap Sandstone of Hinton Group of Mauch Chunk Series in Fork Lick District, Webster County, in road north of Elk River 0.8 mile northwest of Mill Run, 0.7 mile northeast of Ralph, and 3.1 miles east of Webster Springs; elevation, 1935′ B.; collected by David B. Reger and referred to David White; see Local Measurement in the description of Coney Shale, page 297, and also Chapter XIV.

Lot 455.—Marine fossils from Glenray Limestone of Bluefield Group of Mauch Chunk Series in Fork Lick District, Webster County, in State road north of Back Fork of Elk River just east of bridge at north end of Webster Springs; elevation, 1460′ B.; collected by David B. Reger and referred to John L. Tilton; see No. 49 of Webster Springs Section, page 182, and also Chapter XV.

Lot 461.—Plant fossils from roof of the Sewell Coal of New River Group of Pottsville Series in Beverly District at Davis Coal Land Co. Prospect (No. 303 on Map II), on Left Fork of Fishinghawk Creek 1.2 miles west of Bemis; elevation, 2840′ B.; collected by David B. Reger and referred to David White; see Chapter XIV.

Lot 463.—Plant fossils from Fredonia portion of Union Limestone of Greenbrier Series in Leadsville District at Gates and Bailey quarry in Rich Mountain south of Tygart River just southeast of Aggregates; collected by David B. Reger and B. L. Miller and referred to John L. Tilton; see No. 34 of Aggregates Section, page 151, and also Chapter XV.

PENNSYLVANIAN PLANT COLLECTIONS.

KANAWHA GROUP OF POTTSVILLE SERIES.

Roof of Gilbert Coal—Lot 447.

Field description by David B. Reger:
Collection of fern fronds, stems, and **Stigmaria**.
Shipped to David White at Washington.

NEW RIVER GROUP OF POTTSVILLE SERIES.

Roof of Sewell (Sharon) Coal—Lot 412.

Field identifications by David White:
Mariopteris inflata.
Sphenophyllum cuneifolium.
Alethopteris grandifolia.
Neuropteris sp.
Whittlesia elegans.
Shipped to David White at Washington.

Roof of Sewell (Sharon) Coal—Lot 436.

Field identifications by David B. Reger:
- Calamites.
- Lepidodendron.
- Sigillaria.
- Annularia.
- Branching ferns.
- Many large stems.

Shipped to David White at Washington.

Roof of Sewell (Sharon) Coal—Lot 408.

No record of identifications; shipped to David White at Washington.

Roof of Sewell (Sharon) Coal—Lot 403.

Field identifications by David White:
- Mariopteris inflata.

Shipped to David White at Washington.

Roof of Sewell (Sharon) Coal—Lot 461.

Identifications by David White at Morgantown:
- Sphenopteris dicksonioides.
- Lepidophyllum cf. lanceolatum.
- Mariopteris pygmaea White.

Collection stored at Morgantown.

Roof of Sewell (Sharon) Coal—Lot 449.

Identifications by David White at Morgantown:
- Calamites suckowii.
- Calamites cistii Brgt.
- Calamites cf. ramifer.
- Lepidodendron arbovatum?
- Lepidodendron aculeatum.
- Stigmaria verrucosa.
- Sphenopteris hoeninghausii.
- Sphenopteris sp.
- Spenopteris cf. gracilis.
- Sphenopteris dicksonioides?
- Artisia approximata.
- Mariopteris sp.
- Neuropteris sp.
- Neuropteris gigantea?
- Neuropteris elrodi? or Alethopteris?
- Lepidocystus cultriforme.
- Cordianthus sp.
- Alethopteris serlii?
- Lepidophyllum cf. cultriforme.

Stored at Morgantown.

Pavement under Sewell (Sharon) Coal—Lot 381.

Identifications by David White at Morgantown:
Alethopteris grandifolia.
Mariopteris cf. pygmaea.
Trigonocarpum oliveiforme.
Trigonocarpum n. sp.
Neuropteris elrodi Lx.
Sphenopteris sp.
Collection stored at Morgantown.

Roof of Welch Coal—Lot 404.

No record of identifications; shipped to David White at Washington.

Roof of Welch Coal—Lot 406.

No record of identifications; shipped to David White at Washington.

Roof of Welch Coal—Lot 380.

Identifications by David White at Morgantown:
Neuropteris schlehani.
Collection stored at Morgantown.

Upper Raleigh (Sharon) Sandstone—Lot 443.

Plant stems.
Collection stored at Morgantown.

Roof of Fire Creek Coal, Deer Lick Mine on Shavers Fork (Mine No. 423 on Map II)—No Lot Number.

Identification by David White at Morgantown:
Calamites ramosus?
Stored at Morgantown.

Shales Below Fire Creek Coal—Lot 450.

Identifications by David B. Reger:
Sigillaria.
Collection consists of single cross-section of a large stem 20 inches in diameter; stored at Morgantown.

MISSISSIPPIAN PLANT COLLECTIONS.

BLUESTONE GROUP OF MAUCH CHUNK SERIES.

Lot 442.

Identifications by David White at Morgantown:
Bornia radiata.
Megaspore.
Worm trail.
Collection stored at Morgantown.

PRINCETON CONGLOMERATE OF MAUCH CHUNK SERIES.

Lot 453.

Field identifications by David B. Reger:
Calamites, possibly Bornia radiata.
Other unknown stems.
Collection shipped to David White at Washington.

Lot 444.

Identifications by David White at Morgantown:
Bornia radiata (Asterocalamites scrobiculatus).
Stored at Morgantown.

BLUEFIELD GROUP OF MAUCH CHUNK SERIES.

Coney Shale—Lot 454.

Field identifications by David B. Reger:
Fern fronds.
Plant stems.
Shipped to David White at Washington.

Graham Sandstone—Lot 422.

No record of identifications; shipped to David White at Washington.

Webster Springs Sandstone—Lot 452.

Field identifications by David B. Reger:
Bornia radiata (?) (Asterocalamites scrobiculatus) (?).
Shipped to David White at Washington.

GREENBRIER SERIES.

Alderson Limestone—Lot 305.

Field identifications by David B. Reger:
Plant stems.
Shipped to David White at Washington.

Union (Fredonia portion) Limestone—Lot 463.

Identifications by John L. Tilton at Morgantown:
Stems of plants (trees).
(See Chapter XV).
Handed to Dr. Tilton at Morgantown.

DEVONIAN PLANT COLLECTIONS.

CATSKILL SERIES.

Portion Above Saxton Shale—Lot 409.

Field identifications by David White:
Archaeopteris hybernica.
Archaeopteris sphenophylloides?
Shipped to David White at Washington.

Saxton Shale—Lot 360.

Field identifications by David White:
Archaeopteris sp.
Dimeripteris sp.
Psylophyton princeps?
Pelecypods.
Fish plates.
Shipped to David White at Washington.

Saxton Shale—Lot 356.

Field identifications by David B. Reger:
Fern fronds.
Plant stems.
Stored at Morgantown.

Saxton Shale—Lot 375.

Field identifications by David B. Reger:
Fern fronds.
Pelecypods
Fish teeth.
Shipped to David White at Washington.

Saxton Shale—Lot 376.

Field identifications by David White:
Archaeopteris?
Dimeripteris.
Fish scales and plates.
Brachiopods (Lingula).
Pelecypods.
Shipped to David White at Washington.

Portion Below Saxton Shale—Lot 445.

Field description by David B. Reger:
Smooth-surfaced silicified tree stems; largest diameter, 13 inches.
Stored at Morgantown.

Portion Below Saxton Shale—Lot 451.

Field identifications by David B. Reger:
Archaeopteris.
Silicified tree trunks.
Stored at Morgantown.

Portion Below Saxton Shale—Lot 428.

Field identifications by David B. Reger:
Archaeopteris.
Dimeripteris.
Tree trunk roots, not transported.
Shipped to David White at Washington.

Portion Below Saxton Shale—Lot 427.

Field identification by David White:
Dimeripteris.
Shipped to David White at Washington.

Portion Below Saxton Shale—Lot 410.

Field identifications by David White:
Archaeopteris (scarce).
Dimeripteris (abundant).
Shipped to David White at Washington.

Portion Below Saxton Shale—Lot 439.

Field identification by David B. Reger:
Dimeripteris.
Shipped to David White at Washington.

Portion Below Saxton Shale—Lot 411.

No record of identifications; shipped to David White at Washington.

CHEMUNG SERIES.

Hendricks Sandstone—Lot 361.

Field description by David B. Reger:
Small carbonized plant stems.
Handed to John L. Tilton at Morgantown.

Hendricks Sandstone—Lot 407.

Field description by David B. Reger:
Numerous small plant stems; no record of identifications.
Shipped to David White at Washington.

Valley Head Sandstone—Lot 374.

Field description by David B. Reger:
Numerous large stems of trees; largest diameter noted 4′ 0″ by 12½″ (now destroyed); specimens mostly left in place; a few stored at Morgantown.

Valley Head Sandstone—Lot 438.

Field identifications by David B. Reger:
Taonurus caudi-galli.
Cruziana.
Small carbonized tree stems with some cell structure and a few leaf scars.
Stored at Morgantown.

Valley Head Sandstone—Lot 390.

Field description by David B. Reger:
Tree stems with crenulated surfaces, mostly less than 1 ft. diameter.
Stored at Morgantown?

Valley Head Sandstone—Lot 399.

Field identifications by David White:
Dadoxylon.
Dimeripteris.
Rachiopteris.
Fucoids (very abundant).
Pteridichnites biseriatus (a trail).
Shipped to David White at Washington.

Elkins Sandstone—Lot 396.

Field description by David B. Reger:
Many large tree trunks without leaf scars or cortical markings, but partly having transverse crenulations; largest diameter measured, 10 ft. 6 in. by 16 in.; mostly left in place, but a few small specimens shipped to David White at Washington and a few stored at Morgantown.

Elkins Sandstone—Lot 397.

No record of identifications; a few small tree stems; shipped to David White at Washington.

Elkins Sandstone—Lot 367.

Field description by David B. Reger:
Numerous small macerated branches of trees and a few carbonized stems.
Stored at Morgantown.

Elkins Sandstone—Lot 366.

Field description by David B. Reger:

Two flattened stumps of trees (largest diameter, 14 inches).
Numerous small macerated branches.
Some flattened stems.

Mostly stored at Morgantown; some small specimens shipped to David White at Washington.

Elkins Sandstone—Lot 413.

Field identifications by David B. Reger:

Plant stems, mostly Thallophytes?

One slab stored at Morgantown; others shipped to David White at Washington.

Elkins Sandstone—Lot 388.

Field description by David B. Reger:

Numerous stems of trees, one of which is nearly round and about 3 feet in diameter by 12 feet in length; certain others visible in cross-section; many specimens have transverse crenulations.

Several tons stored at Morgantown, including portion of large specimen above described; some smaller pieces shipped to David White at Washington.

Elkins Sandstone—Lot 394.

Field description by David B. Reger:

Numerous large tree trunks, including one flattened stem with diameter measuring 4′ 0″ by 1′ 7″.

Mostly left in place; some smaller specimens collected and shipped to David White at Washington?

Elkins Sandstone—Lot 402.

Field description by David B. Reger:

Numerous large stems of trees, one of which measured 5 feet in diameter.

Mostly left in place; a few small specimens shipped to David White at Washington.

Elkins Sandstone—Lot 401.

Field description by David B. Reger:

One depressed impression of a round plant stem 15 feet in visible length and 2 inches in diameter; mold partly refilled with other material.

Mostly left in place; a few fragments shipped to David White at Washington.

Elkins Sandstone—Lot 395.

Field description by David B. Reger:
Numerous large trunks of trees, flattened, distorted, and silicified.
Mostly left in place; some small specimens stored at Morgantown.

PORTAGE SERIES.

Middle or Lower Portion—Lot 369.

Field description by David B. Reger:
Numerous silicified half-sections of tree trunks; largest diameter measured, 0′ 8″; some faint indications of leaf scars; slight resemblance to **Eospermatopteris.**
Partly stored at Morgantown and partly shipped to David White at Washington.

Middle or Lower Portion—Lot 398.

Field description by David B. Reger:
Numerous silicified half-sections of small trees, like Lot 369.
Shipped to David White at Washington.

Middle Portion—Lot 393.

Field identifications by David B. Reger:
Fragments of small branches of trees.
Thallophytes?
Pteridichnites biseriatus (a trail).
Stored at Morgantown.

Lower Portion—Lot 392.

Field identifications by David B. Reger:
Thallophytes? or tree trunks? (small silicified half-sections).
Pteridichnites biseriatus (a trail).
Stored at Morgantown.

Lower Portion—Lot 368.

Field description by David B. Reger:
Numerous small macerated branches of trees.
Partly stored at Morgantown and partly shipped to David White at Washington.

CHAPTER XV.

NOTES ON PALEONTOLOGY.

By
John L. Tilton.

INTRODUCTION.

The fossils included in the accompanying lists were collected by David B. Reger, then Assistant Geologist of the West Virginia Geological Survey, in the summers of 1926 and 1927. While they are not presented as complete lists of fossils of the different formations they afford representative collections. In the first table the geologic range of the fossils is given as seen in the collections and in the collections only. In the second table the geologic order is followed beginning at the top. The numbers are the collection numbers used by Mr. Reger in the field and in the preparation of his manuscript. In the report that follows the collections are considered in the order given in this second table.

Geological Range of Fossils as seen in the Collections.

	Devonian System (Upper)									Mississippian System							Pennsylvanian System
	Genesee Series	Portage Series	Chemung Series					Catskill Series	Pocono Series	Greenbrier Series			Mauch Chunk Series				Pottsville Series
										Union							
			Near Base Lower Shales	Elkins	Middle Shales 888'—1114' below top	Valley Head	Hendricks		Broad Ford	Fredonia	Gasper	Alderson (Glen Dean)	Glenray	Reynolds	Terry	Bluestone	New River (Hartridge)
Plantae																	
Algae			*	*													
Woody Fiber				*													
Branches or Stems				*		?	*		*	*			*				*
Bornia radiata																*	
Megaspore																*	
Spongidae				?													
Coelenterata																	
Zaphrentis spinulosa												*					
Zaphrentis chemungensis				*													
Crinoid stems	*		*	*	*	*	*		*			*	*		*		
Vermes																	
Worm trails and borings								?								*	
Bryozoa																	
Batostomella sp.						*											
Bryozoa (branching)				*	*		*						*				
Bryozoa (encrusting)				*													
Stenopora sp.												*	*				
Fenestella sp.				*								*				*	
Archimedes sp.													*				
Brachiopoda																	
Protremata																	
Dalmanella tioga			*														
Dalmanella sp.						*											
Schizophoria striatula				*													

Geological Range of Fossils as seen in the Collections (Continued).

	Devonian System (Upper)									Mississippian System							Pennsylvanian System
	Genesee Series	Portage Series	Chemung Series					Catskill Series	Pocono Series	Greenbrier Series			Mauch Chunk Series				Pottsville Series
										Union							
			Near Base Lower Shales	Elkins	Middle Shales 888'—1114' below top	Valley Head	Hendricks		Broad Ford	Fredonia	Gasper	Alderson (Glen Dean)	Glenray	Reynolds	Terry	Bluestone	New River (Hartridge)
Leptostrophia perplana var. nervosa				*													
Douvillina cayuta			*	*													
Schuchertella chemungensis			*	*	*	*											
Orthotetes kaskaskiensis									*			*	*	*	*		
Chonetes scitulus			?														
Productella lachrymosa		*		*	*	*											
Productella?				*													
Productus ovatus												*	*	*			
Diaphragmus elegans												*	*	*			
Echinoconchus alternatus												*					
Telotremata																	
Camarotoechia contracta			*			*											
Camarotoechia eximia				*	*	*											
Camarotoechia subarcuata							*										
Camarotoechia sp.						*			*								
Atrypa spinosa				*													
Atrypa hystrix				*													
Spirifer disjunctus				*	*	*											
Spirifer mesastrialis				*													
Spirifer mesacostalis			*	*	*	*											
Spirifer pellaensis												*	*	*			
Spirifer sp.						*											
Composita trinuclea												*		*			

Geological Range of Fossils as seen in the Collections (Continued).

	Devonian System (Upper)									Mississippian System							Pennsylvanian System
	Genesee Series	Portage Series	Chemung Series					Catskill Series	Pocono Series	Greenbrier Series			Mauch Chunk Series				Pottsville Series
										Union							
			Near Base Lower Shales	Elkins	Middle Shales 888'—1114' below top	Valley Head	Hendricks		Broad Ford	Fredonia	Gasper	Alderson (Glen Dean)	Glenray	Reynolds	Terry	Bluestone	New River (Hartridge)
Composita subquadrata												*		*			
Syringothyris textus?									*								
Ambocoelia umbonata			*	*	*	*											
Cliothyridina sublamellosa												*			?		
Pelecypoda																	
Grammysia subarcuata							*										
Sphenotus contractus						*	*										
Buchiola retrostriata	*																
Palaeoneilo concentrica									*								
Palaeoneilo angusta				?													
Palaeoneilo sp.									*								
Pterinea nodocosta				*		*											
Pterinea chemungensis				*													
Pterinea sp.						*											
Myalina sp.														*			
Naiadites elongata																	*
Allorisma clavata												*					
Ectenodesma birostratum				*													
Liopteria bigsbyi					*		?										
Leptodesma medon				?	*		*										
Leptodesma elongata						*											
Leptodesma sp.				*													
Aviculopecten sp.															*		
Cypricardella sp.				?		*											

Geological Range of Fossils as seen in the Collections (Concluded).

	Devonian System (Upper)									Mississippian System							Pennsylvanian System
	Genesee Series	Portage Series	Chemung Series					Catskill Series	Pocono Series	Greenbrier Series			Mauch Chunk Series				Pottsville Series
										Union							
			Near Base Lower Shales	Elkins	Middle Shales 888'—1114' below top	Valley Head	Hendricks		Broad Ford	Fredonia	Gasper	Alderson (Glen Dean)	Glenray	Reynolds	Terry	Bluestone	New River (Hartridge)
Cypricardinia elegans						*											
Pelecypod					*				*								
Gastropoda																	
Pleurotomaria									?								
Straparollus planidorsatus													*	*			
Straparollus sp.												*					
Platyceras sp.									*								
Gastropod									*								
Pteropoda																	
Styliolina fissurella	*																
Tentaculites			*	*													
Cephalopoda																	
Orthoceras						*	*		*								
Arthropoda																	
Phillipsia sp.												*					
Pisces																	
Psammodus sp.												*					
Petalodus sp.											*						
Eurylepis sp.															?		
Palaeoniscus sp.															*		

DISTRIBUTION OF FOSSIL COLLECTIONS BY GEOLOGIC FORMATIONS.

Pennsylvanian System

- Pottsville Series
  - New River Group
    - Hartridge Shale, No. 405.

Mississippian System

- Mauch Chunk Series
  - Bluestone Group, Nos. 391, 442.
  - Princeton Group
  - Hinton Group
    - Terry Shale and Limestone, Nos. 379, 448.
  - Bluefield Group
    - Reynolds Limestone, No. 378.
    - Glenray Limestone, No. 455.

- Greenbrier Series
  - Alderson (Glen Dean), Nos. 372, 377.
  - Cypress
  - Union, No. 349.
  - Rosiclare (Bethel)
  - Fredonia, No. 463.
  - Patton
  - Hillsdale

- Maccrady Series

- Pocono Series
  - Broad Ford, Nos. 352, 353, 371.
  - Sunbury
  - Berea

Devonian System

- Upper Devonian
  - Catskill Series, No. 440.
  - Chemung Series
    - Hendricks, Nos. 361, 400, 441.
    - Valley Head, Nos. 389, 437, 438.
    - Middle Shales, Nos. 362, 363.
    - Elkins, Nos. 350, 351, 354, 359, 364, 365, 373.
    - Lower Shales (basal), Nos. 357, 358.
  - Portage Series, No. 370.
  - Genesee Series, No. 356.

IDENTIFICATIONS AND COMMENT.

POTTSVILLE SERIES.

NEW RIVER GROUP.

Hartridge Shale.

No. 405.—Location: Beverly District, Randolph County; at Walkers New River Mining Company mine on Cheat Mountain, west of Shavers Fork 1.2 miles southwest of Flint, at elevation of 2936 feet.

Matrix: A dark, micaceous, non-calcareous and somewhat concretionary shale, with flakes of gypsum.

Fossils:

Flattened stems of plants, now 2 mm. wide.
Naiadites elongata.

Comment: A portion of the plant remains is carbonized epidermal tissue. There are impressions of straight fibrovascular bundles.

MAUCH CHUNK SERIES.

BLUESTONE GROUP.

No. 442. — Location: Circleville District, Pendleton County; on Spruce Mountain 0.1 mile south of Spruce Knob, at elevation of 4795 feet; extreme top of Mauch Chunk.

Matrix: A light-brown, fine-grained shaly sandstone, slightly micaceous, non-calcareous.

Fossils:

Bornia radiata.
Megaspore.
Worm trail (across impression of plant).

Comment: The above identifications are by Dr. David White of Washington, D. C. The collection as a whole contains numerous impressions which are thought to be of the same kind of plant.

No. 391. — Location: Dry Fork District, Randolph County; on Middle Point north of Taylor Run 1.8 miles northeast of Bowden, at elevation of 3000 feet.

Matrix: An argillaceous shale, slightly micaceous, non-calcareous, mottled brown with minute stains of limonite.

Fossils:

Fenestella sp.

Comment: The small fragment of shale has impressions of the reverse side of a foliar expansion of Fenestella.

HINTON GROUP.

Terry Shale and Limestone.

No. 379.—Location: Beverly District, Randolph County; in old railroad grade (now county road) on west side of Shavers Fork of Cheat River 0.6 mile north of Bemis, at elevation of 2720 feet.

Matrix: A dark, irregular, fossiliferous and calcareous shale.

Fossils:

Crinoid stems.
Orthotetes kaskaskiensis.
Cliothyridina sublamellosa?

Comment: This is an Orthotetes horizon. The shale contains a mass of the shells, most of them distorted. In the forms that are thought to be Cliothyridina there are no spines preserved.

No. 448. — Location: Huttonsville District, Randolph County; in the cut of the Western Maryland Railway east side of Shavers Fork just south of Lambert Run and 1.6 miles southwest of Cheat Bridge, at elevation of 3581 feet.

Matrix: There are two extremes. One is a concretionary reddish limestone, very hard, cherty, and full of fish scales. The other is a gray shale, micaceous, non-calcareous, somewhat concretionary and somewhat fossiliferous.

Fossils:

Aviculopecten sp.
Pelecypods (indefinite).
Fish bones.
Fish scales (ganoid).
  Palaeoniscus sp.
  Eurylepis?

Comment: The fish scales are in considerable variety. Most of them are rhombic in shape, nearly square, about 2 mm. on a side. Some are smooth and some have diagonal corrugations eight or ten in number. These rhombic forms correspond to the scales of Palaeoniscus. Other scales are elongated and have curved corrugations on which there are lines of granules (Eurylepis?). Others have scroll-like lines ornamenting the surface. One of these measures 3 mm. on a side.

The character of the fossils suggests the presence of a phosphatic deposit. Dr. B. B. Kaplan, Chemist for the Survey, reports the presence of 9.95 per cent. of P_2O_5, which equals 21.73 per cent. of calcium phosphate ($Ca_3P_2O_8$).

BLUEFIELD GROUP.

Reynolds Limestone.

No. 378.—Location: Mingo District, Randolph County; in State road ascending east end of Point Mountain 0.5 mile northwest of Monterville, at elevation of 3110 feet.

Matrix: A dark-gray limestone, weathering light-gray, slightly stained with limonite; very fossiliferous.

Fossils:

Crinoid stems.
Orthotetes kaskaskiensis.
Productus ovatus.
Diaphragmus elegans.
Spirifer pellaensis.
Composita trinuclea.
Composita subquadrata.
Straparollus planidorsatus.
Myalina sp.

Glenray Limestone.

No. 455. — Location: Fork Lick District, Webster County; in State road north of Back Fork of Elk River, just east of bridge at north end of Webster Springs, at elevation of 1460 feet.

Matrix: A dark-gray limestone, weathering light-brown; very fossiliferous.

Fossils:

Impressions of stems of plants.
Crinoid stems.
Bryozoa (branching).
Stenopora sp.
Archimedes sp.
Orthotetes kaskaskiensis (numerous).
Productus?
Diaphragmus elegans.
Spirifer pellaensis.
Straparollus planidorsatus (indistinct).

Comment: The collection is from a bed of Orthotetes with which are associated especially Diaphragmus elegans and Spirifer pellaensis.

GREENBRIER SERIES.

Alderson Limestone (Glen Dean).

No. 372. — Location: Dry Fork District, Randolph County; in private road west of Taylor Run of Shavers Fork

0.5 mile northeast of Chestnut Grove School and one mile east of Bowden, at elevation of 2325 feet.

Matrix: A dark-gray to black limestone, weathering to light-brown, very fossiliferous.

Fossils:

Zaphrentis spinulosa.
Crinoid stems.
Stenopora sp.
Archimedes sp.
Fenestella sp.
Orthotetes kaskaskiensis.
Productus ovatus.
Productus sp.
Diaphragmus elegans.
Spirifer pellaensis.
Composita subquadrata.
Allorisma clavata.
Phillipsia sp. (pygidium).

Alderson Limestone (Glen Dean).

No. 377.—Location: Mingo District, Randolph County; in State road ascending Point Mountain 0.2 mile southwest of Monterville, at elevation of 3020 feet.

Matrix: A dark-gray to black limestone, weathering to light-brown; very fossiliferous. A fragment of thinly bedded oolite, three granules to the millimeter.

Fossils:

Zaphrentis spinulosa.
Orthotetes kaskaskiensis.
Productus ovatus.
Diaphragmus elegans.
Echinoconchus alternatus.
Spirifer pellaensis.
Cliothyridina sublamellosa.
Composita trinuclea.
Straparollus sp.
Psammodus sp.

Union Limestone (Gasper Portion).

No. 349.—Location: Roaring Creek District, Randolph County; at Gates and Bailey quarry on south side of Tygart River 0.3 mile southeast of Aggregates, at elevation of 1920 feet.

Matrix: A dark-gray limestone.

Fossils:

Fish tooth (Petalodus).

Comment: The tooth is rhombic in shape, transversely elongated, length (before broken) 26 mm., height 8 mm., thickness 4 mm. The cutting edge is somewhat undulating and is crenulated, from which striations extend over a surface that is at first concave and then slightly convex. The portion exposed of the opposite side appears smooth. No root is preserved. The base is longitudinally imbricated, nine layers being noted. This is judged to be a cutting tooth of the type of shark known as Petalodus.

Union Limestone (Fredonia Portion).

No. 463. — Location: Leadsville District, Randolph County; at Gates and Bailey quarry in Rich Mountain south of Tygart River just southeast of Aggregates.

Matrix: A fine-grained, light-brown calcareous sandstone.

Fossils:

Stems of plants (trees).

Comment: These are casts of trees in which no microscopic structure has been preserved. They all show evidence of fibrovascular bundles and two of them reveal faint indications of longitudinal fluting. The dimensions of the fragments are as follows:

Length.	Diameter.
6 cm.	8.2 cm. x 4.9 cm.
2.5 cm.	6.4 cm. x 3.6 cm.
3 cm.	4.8 cm. x 3.8 cm.
2 cm.	3.6 cm. x 3.4 cm.

POCONO SERIES.

Broad Ford Sandstone.

No. 352. — Location: Leadsville District, Randolph County; along old Morgantown Pike on east side of Laurel Ridge 5.3 miles northwest of Elkins, at elevation of 2545 feet.

Matrix: A non-calcareous brownish and slightly-green and white sandstone, weathering to a dark-brown; many impressions of fossils, the shells of which are completely dissolved away. In cavities that are left there is asphaltic material.

Fossils:

Crinoid stems.
Syringothyris textus?
Palaeoneilo sp.
Pelecypod.
Platyceras sp.
Gastropod (medium spire).
Orthoceras sp.

Comment: Some of the impressions of Syringothyris reveal the impressions of the syrinx.

The presence of asphaltic material in the cavities left after the removal of the shells by solution is of interest, for it is a product left on the distillation of oil and gas. Elsewhere this sandstone is oil-bearing (Weir Sand).

No. 353. — Location: New Interest District, Randolph County; in public road on northern side of Saltlick Run of Leading Creek 2.3 miles west of Montrose, at elevation of 2305 feet.

Matrix: A very porous, fine-grained, brown, non-calcareous sandstone with a few rounded pebbles. It is very fossiliferous, but with impressions only since all lime has been dissolved away. The impressions are stained a deep brown by limonite.

Fossils:

Crinoid stems.
Orthotetes kaskaskiensis.
Syringothyris textus?
Palaeoneilo concentrica.
Pelecypod.
Pleurotomaria?
Platyceras sp.
Gastropod (medium spire).
Orthoceras sp.

Comment: Special interest in this collection centers in the form which is here listed as Syringothyris textus. Of this form there are several impressions of the exterior of the pedicle valve and also several impressions of the interior of the same valve, all portions of the original shell having been dissolved away. Near the beak of the impressions of the interior there are hollows left of the transverse plate, close to which are conical cavities where the syrinx lay. The impression is thus classified as Syringothyris.

In the impressions of the interior there is evidence of striations along the sinus which seem to be too far forward for muscle impressions. In the impressions of the exterior the sinus is smooth. Even with this recognized difference, the impressions of the exterior and of the interior are judged to be of the same kind of shell, for the dimensions and general shape correspond and the corrugations upon the lateral slopes are the same in number and position.

Length. (so far as preserved).	Width.	Height.	Corrugations upon the lateral slope.
30 mm.	60 mm.	15 mm.	24 (external)
25 mm.	60 mm.	12 mm.	25 (external)
27 mm.	60 mm.	x	(internal)
27 mm.	40 mm.	17 mm.	25 (internal)
35 mm.	50 mm.	18 mm.	23 (external)

The impressions of the exterior of three of the forms reveal a punctate structure of the original shell, and in places there is evidence of concentric lines.

The general appearance of the external impressions raises the question as to whether these are not the impressions of Spirifer disjunctus which survived into the Pocono. The answer is, no. The reasons are as follows: 1. The similarity of the exterior and of the interior, which latter impressions give distinct Syringothyris. 2. So far as preserved the extensions of the hinge line are rounded, not mucronate as in Spirifer disjunctus. 3. The shells are punctate. 4. There are no costations nor fine ribs on the sinus of the external impressions. These points also exclude Spirifer mesastrialis and Spirifer mesacostalis.

No. 371. — Location: Dry Fork District, Randolph County; in bluff north of Shavers Fork of Cheat River just west of Bickle Run and 0.2 mile northwest of Bowden, at elevation of 2240 feet.

Matrix: A non-calcareous brownish and greenish sandstone, fossiliferous. There are a few small spherical quartz pebbles.

Fossils:

Plant impressions (stems).
Crinoid stems.
Orthotetes kaskaskiensis.
Camarotoechia sp.
Syringothyris textus?
Palaeoneilo sp.

Comment: This is essentially a bed of Orthotetes. That it is Orthotetes and not Schuchertella is evident from the presence of the median septum, a feature that is not noted in shells of similar dimensions as recorded in Professional Paper 150-E, p. 116, where Schuchertella chemungensis is mentioned.

Syringothyris is mentioned instead of Pseudosyrinx because in another collection (No. 353) marks of the syrinx are preserved in shells that are similar to these in all other parts preserved. In this collection only outside impressions of the pedicle valve are preserved. Vertical striation along the deltidium is evident, and marks that imperfectly represent a punctate shell. The sinus may best be called smooth though faint evidence of a few corrugations appears. There is no median fold in the sinus, such as is found in nearly all of the Mississippian Spirifers. The form comes nearest to Syringothyris textus though the similarity is not perfect.

An elongated pelecypod seems best referred to Palaeoneilo concentrica, though no emargination is noticeable in the posterior outline.

CATSKILL SERIES.

(About 150 feet above the base).

No. 440. — Location: Dry Fork District, Randolph County; in road north of Flannigan Run 0.5 mile southeast of Evenwood, at elevation of 2780 feet.

Matrix: A fine-grained, grayish sandstone, mottled minutely by limonite. It is non-calcareous and contains an abundance of minute flakes of mica.

Fossils: In one specimen there are numerous small-sized holes, not over a millimeter in diameter, boundaries rough, appearing as shallow pits in the weathered surface or fracture, and extending at right angles to the bedding-planes. In all three specimens there are tube-like markings varying in diameter or width from 2 mm. up to 10 mm., lined with dark-brown limonite, thus presenting a marked contrast with the lighter shade of the matrix. The length of the borings (as seen in the samples) is from 3.5 cm. to 17.5 cm., all approximately at right angles to the bedding-planes. How much farther they extended is not known.

What produced the holes is not evident. In the body of the rock the holes are filled with infiltered sand, and no organic material either of plants or of animals is present. If the borings are caused by marine animals the animals were of different sizes, possibly of different kinds.

CHEMUNG SERIES.

Hendricks Sandstone.

No. 361.—Location: Beverly District, Randolph County; in Staunton and Parkersburg Pike on east side of Rich Mountain 2.9 miles northwest of Beverly, at elevation of 2565 feet.

Matrix: A fine-grained sandstone, brown, with an abundance of hematite; mica fragments very minute, non-calcareous; many impressions of fossils.

Fossils:

Bryozoa (branching) (few).
Camarotoechia subarcuata (numerous).
Grammysia subarcuata.
Sphenotus contractus.
Liopteria bigsbyi?
Leptodesma medon (numerous).
Orthoceras sp.

Comment: This is an horizon of Camarotoechia and pelecypods, among which Grammysia and Leptodesma are most numerous of the pelecypods.

Hendricks Sandstone (Type Locality).

No. 400. — Location: Black Fork District, Tucker County; in mountain road just north of Hambleton and 1 mile northwest of Hendricks, at elevation of 1800 feet.

Matrix: A fine-grained, slightly micaceous sandstone, partly grayish in color and partly dark-brown. There are numerous impressions of fossils stained with brown limonite. Some of the material is breccia, containing angular fragments of fine-grained greenish shale.

Fossils:

Stems of plants (Algae?).
Bryozoa (branching).
Camarotoechia subarcuata.
Sphenotus contractus.
Leptodesma medon (abundant).

Hendricks Sandstone?

No. 441. — Location: Circleville District, Pendleton County; in cut of Spears Lumber Company Railroad at head of Seneca Creek 1.1 miles northeast of Gatewood and 1.8 miles northwest of Spruce Knob, at elevation of 2885 feet.

Matrix: A fine-grained, non-calcareous sandstone, very slightly micaceous, gray in color but weathering to brown.

Fossils:

Bituminous material.
Crinoid stems.
Pelecypod.

Comment: There is nothing in this collection by which to identify the sandstone as Hendricks Sandstone.

Valley Head Sandstone.

No. 389. — Location: Leadsville District, Randolph County; on Kelley Mountain road just southeast of Tunnel Station 3 miles east of Elkins, at elevation of 2465 feet.

Matrix: A fine-grained, non-calcareous sandstone, light-brown and dark-brown in color. The fossils are in the form of impressions.

Fossils:

Plant impressions?
Crinoid stems.
Bryozoa (branching).
Productella lachrymosa.
Dalmanella sp.
Camarotoechia sp.
Spirifer sp.
Pterinea nodocosta.
Sphenotus contractus.
Cypricardinia elegans.
Orthoceras sp.

No. 437.—Location: Mingo District, Randolph County; in Seneca Trail west of Tygart River 0.5 mile northwest of Spangler.

Matrix: There are two phases in the collection. The first is a non-calcareous, greenish, fine-grained sandstone, slightly micaceous, bearing numerous impressions of fossils. The second is a calcareous, dark-blue and brownish sandstone, slightly micaceous, very fossiliferous, bearing numerous fossils whose white calcareous forms present a marked contrast against the background of brown and dark-gray sandstone.

Fossils:

Plant impressions?
Crinoid stems.
Batostomella sp. (abundant).
Schuchertella chemungensis.
Productella lachrymosa.
Dalmanella sp.
Camarotoechia contracta.
Camarotoechia eximia.
Spirifer disjunctus.
Spirifer mesacostalis.
Ambocoelia umbonata.
Pterinea sp.
Leptodesma elongata.
Cypricardella sp.

Comment: In the calcareous phase the same species were found as in the non-calcareous phase excepting those of Dalmanella, Ambocoelia, and the pelecypods, all of which were wanting in the calcareous phase; also anything that appeared like plant impressions. Crinoid stems, Batostomella, and Spirifer mesacostalis were abundant. The branching form of Batostomella is very conspicuous, as it consists of white calcite against the dark limestone.

Almost nothing has been published on the Chemung Bryozoa. Evidently this form (Batostomella) belongs to the

Trepostomata, for the zoaria are composed of tubes dendroid in arrangement that grade from distinctly polygonal tubes diverging slightly from the axis at first in the immature stage to less distinctly polygonal tubes in the mature stage, where they turn outward. The walls become thicker and are not divided into two portions. Mesopores are rare (but one distinct mesopore was noted). The diaphragms become somewhat more numerous toward maturity than in the immature portions, and there is no definite evidence that they were perforated. In some of the diaphragms there are angular outlines that may mark nearly obliterated mesopores. No acanthopores and no communication pores are evident and no monticules are present. The absence of some of these features may be due to the character of the material, for all, both the cell walls and the contents of the zoecia, are of granular calcite.

The description fits best the Batostomellidae, though acanthopores and mesopores are usually present in that family. Here Batostomella is nearest, though no acanthopores are preserved in the material studied.

No. 438.—Location: Mingo District, Randolph County; in Seneca Trail west of Tygart River 0.5 mile northwest of Spangler.

Matrix: This is in two phases. One is a black, argillaceous limestone containing marine fossils. The other is a black non-calcareous shale containing plant impressions and fragments.

Fossils:

Plant impressions and fragments.
Batostomella sp.
Crinoid stems.
Camarotoechia?
Spirifer mesacostalis.

Middle Shales (888 to 948 Feet Below Top of Chemung).

No. 362.—Location: Beverly District, Randolph County; in Staunton and Parkersburg Pike on east side of Rich Mountain 2.4 miles northwest of Beverly, at elevation of 2350 feet.

Matrix.—A fine-grained, greenish and brownish sandstone, non-calcareous, somewhat micaceous, containing many impressions of fossils. The imprints of the fossils are mostly stained a deep brown with limonite.

Fossils:
- Crinoid stems.
- Bryozoa (branching).
- Schuchertella chemungensis (very abundant).
- Productella lachrymosa.
- Camarotoechia eximia.
- Spirifer disjunctus.
- Spirifer mesacostalis.
- Liopteria bigsbyi.

Comment: The horizon is essentially that of Schuchertella chemungensis.

Middle Shales (1089 to 1114 Feet Below Top of Chemung).

No. 363.—Location: Beverly District, Randolph County; in Staunton and Parkersburg Pike on east side of Rich Mountain 2.4 miles northwest of Beverly, at elevation of 2270 feet.

Matrix: A light-brown, fine-grained sandstone, slightly micaceous, but with an abundance of fossil imprints.

Fossils:
- Crinoid stems.
- Bryozoa (branching).
- Productella lachrymosa.
- Spirifer mesacostalis.
- Ambocoelia umbonata.
- Leptodesma medon.
- Pelecypod.

Comment: The crinoid stems and Bryozoa are especially abundant. The Bryozoa may be Batostomella; only the impressions are left.

Elkins Sandstone, Central Portion of Chemung.

No. 350. — Location: Leadsville District, Randolph County; along State road on north side of Tygart River 0.6 mile northwest of Buxton and 2.6 miles northwest of Elkins, at elevation of 1920 feet.

Matrix. — A fine-grained, dark-gray, shaly sandstone, somewhat micaceous, fossiliferous but non-calcareous.

Fossils:
- Schuchertella chemungensis.
- Camarotoechia eximia.
- Atrypa spinosa.
- Spirifer disjunctus.
- Spirifer mesastrialis.
- Leptodesma medon?
- Cypricardella?

No. 351. — Location: Leadsville District, Randolph County; in quarry along State road on north side of Tygart

River 0.6 mile northwest of Buxton and 2.5 miles northwest of Elkins, at elevation of 1940 feet.

Matrix: A greenish, argillaceous and slightly micaceous sandstone, a part of which is calcareous and a part non-calcareous, even though lime of the original shells is still present in the fossils. The fossils are nicely weathered out.

Fossils:

- Douvillina cayuta.
- Productella lachrymosa.
- Productella sp.
- Schizophoria striatula.
- Atrypa spinosa.
- Spirifer disjunctus.
- Tentaculites sp.

No. 354. — Location: Leadsville District, Randolph County; in public road on north side of Craven Run of Leading Creek 3.3 miles northeast of Elkins, at elevation of 2155 feet.

Matrix.—A light-brown, thin-bedded sandstone, non-calcareous; with impressions of fossils.

Fossils:

- Impressions of wood.
- Crinoid stems.
- Fenestella sp.
- Leptostrophia perplana var. nervosa.
- Douvillina cayuta.
- Productella lachrymosa.
- Atrypa spinosa.
- Spirifer disjunctus.
- Pterinea chemungensis.
- Ectenodesma birostratum.

No. 359. — Location: Leadsville District, Randolph County; in road along Chenoweth Creek 0.4 mile east of Hart School and 4.5 miles southeast of Elkins, at elevation of 2165 feet.

Matrix: A fine-grained, shaly, calcareous sandstone, slightly micaceous; fossils largely dissolved out. This may well be called a weathered, dark-gray limestone, for the least weathered portions of the matrix are of that character.

Fossils:

- Spirifer disjunctus.
- Atrypa hystrix.

No. 364.—Location: Beverly District, Randolph County; in Staunton and Parkersburg Pike near eastern base of Rich Mountain 1.9 miles northwest of Beverly, at elevation of 2045 feet.

Matrix: A fine-grained, greenish-brown, non-calcareous

PLATE LXXI.—View from low hill 1.2 miles due north of Dailey looking northeast across Tygart Valley toward Beverly which is at extreme left. In the background is Cheat Mountain capped by Pottsville and representing Schooley Peneplain. Next is Elliott Ridge covered by Chemung and making Weverton Peneplain. Lower hills are Portage and represent a much lower peneplain. At right middle above State road is a terrace of Tygart River. Immediate foreground and valley are Portage. (Photo. by E. E. Harris.)

PLATE LXXII.—Folded Portage rocks at road fork between Leading Creek and Claylick Run 1.8 miles north of Elkins and just east of Deer Park Anticline. (Photo. by E. E. Harris.)

PLATE LXXIII.—Folded Portage strata in bluff east of Tygart River at Burnt Bridge one mile northeast of Dailey. (Photo. by E. E. Harris.)

PLATE LXXIV.—View from low point 1½ miles west of Kerens looking north along Deer Park Anticline and Davis Lick Run, showing Genesee topography in valley with Portage in low hills on either side. (Photo. by E. E. Harris.)

sandstone, with impressions of fossils. Some of the impressions are deeply stained with limonite.

Fossils:

Plant impressions.
Crinoid stems.
Fenestella sp.
Bryozoa (branching).
Bryozoa (encrusting)?
Schizophoria striatula.
Leptostrophia perplana var. nervosa.
Douvillina cayuta.
Productella lachrymosa.
Atrypa hystrix.
Spirifer disjunctus.
Spirifer mesacostalis.
Pterinea chemungensis.

No. 365. — Location: Leadsville District, Randolph County; in State road on a branch of Isner Creek at foot of Kelley Mountain 2.5 miles southeast of Elkins, at elevation of 2150 feet.

Matrix: A greenish-gray sandstone, non-calcareous; with imprints of fossils.

Fossils:

Plant impressions (branching Algae).
Zaphrentis chemungensis.
Crinoid stems.
Fenestella sp.
Bryozoa (branching).
Bryozoa (encrusting).
Schizophoria striatula.
Leptostrophia perplana var. nervosa.
Douvillina cayuta.
Productella lachrymosa.
Atrypa spinosa.
Atrypa hystrix?
Spirifer disjunctus.
Spirifer mesacostalis.
Spirifer mesastrialis.
Ambocoelia umbonata.
Pterinea chemungensis.

No. 373.—Location: Mingo District, Randolph County; in cut of Valley River Railroad on east side of Tygart River 0.3 mile north of Spangler, at elevation of 2180 feet. (This number is also for Dr. White).

Matrix: A dark-gray, fine-grained, shaly sandstone, non-calcareous, slightly micaceous.

Fossils:

Zaphrentis chemungensis.
Concentric sponge?
Schizophoria striatula.
Douvillina cayuta.
Productella lachrymosa.
Atrypa spinosa.
Spirifer disjunctus.
Ambocoelia umbonata.
Palaeoneilo angusta?
Pterinea nodocosta.
Pterinea chemungensis.
Ectenodesma birostratum.
Leptodesma sp.

Comment: The single coral is the coral itself, with proportions, external markings and number of septae as described for the species named. It also reveals the presence of numerous dissepiments. Of the sponge-like form there is nothing of the original material left, simply marked concentric layers as of a concentric sponge.

Lower Shales (Basal 50 Feet of Chemung).

No. 357.—Location: New Interest District, Randolph County; in Western Maryland Railway cut on headwaters of Leading Creek 1.5 miles northeast of Montrose.

Matrix: A bluish and brownish shaly sandstone, non-calcareous; with impressions of fossils.

Fossils:

Plant impressions (fucoids?).
Crinoid stems.
Chonetes scitulus?
Ambocoelia umbonata (very abundant).

Comment: The collection marks a bed of Ambocoelia umbonata, which are common at the base of the Chemung.

Lower Shales (About 700 Feet Above Base of Chemung).

No. 358. — Location: Leadsville District, Randolph County, on Loglick Run of Stalnaker Run of Leading Creek 1.9 miles east of Whyte; at elevation of 2090 feet.

Matrix: A light-brown to dark-brown, fine-grained sandstone, slightly micaceous, non-calcareous; containing imprints of fossils.

Fossils:

Crinoid stems.
Dalmanella tioga.
Douvillina cayuta.
Schuchertella chemungensis.
Camarotoechia contracta.
Spirifer mesacostalis.
Ambocoelia umbonata.
Tentaculites sp.

PORTAGE SERIES.

No. 370. — Location: Leadsville District, Randolph County; on a branch of Leading Creek 0.3 mile east of Read Station and 2 miles north of Elkins, at elevation of 2055 feet.

Matrix: A gray, fine-grained, non-calcareous sandstone. Imprints of fossils occur in a shaly parting.

Fossils:

Productella lachrymosa.

Comment: In a hand specimen of the sandstone there are five impressions of the Productella. Two other impressions are not sufficiently complete for identification.

In Maryland Productella is reported from the uppermost beds only of the Portage (Parkhead Member).

GENESEE SERIES.

No. 356.—Location: New Interest District, Randolph County; in public road north of Stonespring Run of Leading Creek 1.4 miles northwest of Kerens, at elevation of 2005 feet.

Matrix: A fissile, black shale, argillaceous and non-calcareous, weathering to a light yellowish brown.

Fossils:

Crinoid stem.
Buchiola retrostriata.
Styliolina fissurella (very abundant).

APPENDIX.

Levels Above Mean Tide.

RAILROAD LEVELS.

Baltimore & Ohio Railroad—Pickens Branch.

Miles from Macpelah Junction.	Stations.	County.	Elevation. Feet.
0.0	Macpelah Junction	Lewis	1022
15.0	Buckhannon	Upshur	1411
20.8	Hampton	Upshur	1429
23.2	Sago	Upshur	1435
28.2	Tenmile	Upshur	1620
33.5	Alton	Upshur	1810
37.1	Alexander	Upshur	1849
40.8	Newlon	Upshur	1912
43.2	Craddock	Upshur	2061
45.3	Arvondale Junction	Randolph	2260
46.8	Silica	Randolph	2341
50.2	Pickens	Randolph	2697

Alexander and Eastern Railroad.

Miles.	Stations.	County.	Elevation. Feet.
0	Junction of W. Va. & Pgh. Div., B. & O. R. R., Alexander	Upshur	1690
5	Palace Valley	Upshur	1930
6	Camp Creek	Randolph	2000
8	Star	Randolph	2115
10	Beech Run	Randolph	2260
14	Tenneys (Hartridge)	Randolph	2400
15	"Y"	Randolph	2500
17	Junction	Randolph	2550
17¼	End of Line (1908)	Randolph	2565

Coal and Coke Railway (B. & O.)—Main Line.

Miles from Charleston.	Stations.	County.	Elevation. Feet.
0.0	Charleston	Kanawha	597
144.3	Sago	Upshur	1469
145.7	Nixon	Upshur	1530
147.5	Strader	Upshur	1679
149.0	Reed Tunnel, No. 5	Upshur	1767
149.3	Goodwin	Upshur	1762
149.8	Shipman Tunnel, No. 4	Upshur	1791
151.9	Sand Run	Upshur	1962
152.2	Groves Tunnel, No. 3	Upshur	1991
154.7	Midvale	Randolph	1862
155.9	Lantz	Randolph	1887
157.9	Orr	Randolph	2057
158.0	Orr Tunnel, No. 2	Randolph	2081
159.4	Kingsville Tunnel, No. 1	Randolph	2181
159.5	Kingsville	Randolph	2167
162.5	Loop	Randolph	2022
166.0	Leiter	Randolph	1837
167.5	Roaring Creek Junction (Norton)	Randolph	1867
171.8	*Coalton	Randolph	2157
174.5	Belington	Barbour	1698
175.2	†Elkins	Randolph	1930

*B. M. on southeast corner of Company Store..
†B. M. on top step of Western Maryland Railway Office Building.

Western Maryland Railway—Main Line.

Miles from Baltimore.	Stations.	County.	Elevation. Feet.
252.9	Parsons	Tucker	1656
255.5	Porterwood	Tucker	1706
256.9	Moore	Tucker	1780
261.5	Haddix Summit	Randolph	2193
263.1	Montrose	Randolph	2000
267.9	Kerens	Randolph	1953
269.5	Whyte	Randolph	1940
270.8	Gilman	Randolph	1934
272.4	Read	Randolph	1926
274.7	Elkins	Randolph	1933
275.9	Elkins Junction	Randolph	1933
276.8	Buxton	Randolph	1929
282.3	Roaring Creek Junction (Norton)	Randolph	1868
282.7	Harding	Randolph	1854
285.8	Laurel	Barbour	1761
288.4	Junior	Barbour	1731
289.8	Dartmoor	Barbour	1724
292.3	Belington	Barbour	1706

Western Maryland Railway—Weaver Branch.

Miles from Baltimore.	Stations.	County.	Elevation. Feet.
292.3	Belington	Barbour	1706
295.8	Harts Summit	Barbour	2023
298.2	Weaver	Randolph	1938

Western Maryland Railway—Huttonsville Branch.

Miles from Baltimore.	Stations.	County.	Elevation. Feet.
274.7	Elkins	Randolph	1933
275.9	Elkins Junction	Randolph	1933
----	Scotts Summit	Randolph	1977
277.8	Arnold Hill	Randolph	1936
281.4	Beverly	Randolph	1955
284.8	Dailey	Randolph	1972
287.5	Valley Bend	Randolph	1988
291.1	Mill Creek	Randolph	2023
292.3	Huttonsville	Randolph	2029

Western Maryland Railway—Durbin Branch.

Miles from Baltimore.	Stations.	County.	Elevation. Feet.
274.7	Elkins	Randolph	1933
279.4	Tunnel Station	Randolph	2326
----	Tunnel No. 1 Summit	Randolph	2367
280.8	Lumber	Randolph	2298
282.3	Meadows	Randolph	2181
284.2	Faulkner	Randolph	2206
284.8	Bowden	Randolph	2212
289.2	Woodrow	Randolph	2353
290.5	Montes	Randolph	2426
293.5	Bemis	Randolph	2591
296.8	Morribell	Randolph	2838
----	Tunnel No. 2 Summit	Randolph	2939
299.2	Glady	Randolph	2915
----	Summit Cut	Pocahontas	3147
305.8	Wildell	Pocahontas	3060
----	Gertrude	Pocahontas	3006
310.6	May	Pocahontas	2963
313.9	Burner	Pocahontas	2923
316.1	Braucher	Pocahontas	2882
321.8	Durbin	Pocahontas	2723

Central West Virginia and Southern Railroad.

Miles from Hendricks.	Stations.	County.	Elevation. Feet.
0.0	Hendricks	Tucker	1713
3.7	Red Run	Tucker	1816
4.8	Moores Siding	Tucker	1846
6.0	Richford	Tucker	1876
7.5	Mill Run	Tucker	1907
8.3	Elk Lick	Tucker	1919
9.9	Gladwin	Tucker	1969
13.0	Jenningston	Tucker	2055
15.0	Scotts Siding	Tucker	2113
17.0	Red Creek Junction	Tucker	2164
21.0	Harman	Randolph	2336
24.6	Hazelwood	Randolph	2507
26.4	Job	Randolph	2581
28.7	Glady	Randolph	2677
29.5	Armentrout	Randolph	2720
30.7	Whitmer	Randolph	2760
31.3	Horton	Randolph	2775

UNITED STATES GEOLOGICAL SURVEY LEVELS.

The various topographic quadrangles which make up the area of Randolph County have been covered with a network of primary spirit-levels run by the Topographic Branch of the United States Geological Survey, with financial cooperation from the West Virginia Geological Survey. In addition to these a few precise lines differing mainly in the manner in which they are checked for errors, as hereinafter quoted, have also been run. Some of these levels have already been published in various bulletins of the United States Geological Survey but all the lines which lie wholly or partly in the county are now published in full in the following pages, as supplied by Dr. George Otis Smith, Director, United States Geological Survey.

By way of explanation the following descriptive remarks are quoted from Bulletin No. 632 of the United States Geological Survey, pages 5-7; 1916, the same being followed by the detailed levels:

"**Classification.**—The elevations are classified as precise or primary, according to the methods employed in their determination. The former are determined by lines of levels run either in both forward and backward directions or by simultaneous double-rodded lines, a high-grade instrument being used and special precautions being taken in observations and reduction to correct errors and make the line continuously good throughout. The latter or primary levels are determined with the Y level, precautions being taken against only the principal errors and the levels being run mostly in circuits of single lines. The allowable limit of error observed on the precise work already done by the Geological Survey in this State is represented in feet by 0.02 times the square root of D, and that for the primary work by 0.05 times the square root of D in which D is the length of the circuit in miles.

"**Bench Marks.**—The standard bench marks are of two forms. The first form is a circular bronze or aluminum tablet, 3½ inches in diameter and ¼ inch thick, having a 3-inch stem, which is cemented in a drill hole in solid rock in the wall of some public building, a bridge abutment, or other substantial masonry structure. The second form, used where masonry or rock is not available, consists of a hollow wrought-iron post 3½ inches in outer diameter and 4 feet in length. The bottom is spread out to a width of 10 inches in order to give a firm bearing on the earth. A bronze or aluminum cap is riveted upon the top of the post which is set about 3 feet in the ground. A third style of bench mark, with abbreviated lettering, is used for unimportant points. This consists of a special copper nail 1½ inches in length driven through a copper washer ⅞ inch in diameter. The tablets as well as the caps on the iron posts are appropriately lettered, and cooperation by States is indicated by the addition of the State name.

"The numbers stamped on the bench marks described in the following pages represent the elevations to the nearest foot as determined by the levelman. These numbers are stamped with 3/16-inch steel dies on the tablets or post caps, to the left of the word 'Feet'. The office adjustment of the notes and the reduction to mean sea-level datum may so change some of the figures that the original markings are 1 to 2 feet in error. It is assumed that engineers and others who have occasion to use the bench-mark elevations will apply to the Director of the United States Geological Survey, at Washington, D. C., for the adjusted values, and will use the markings as identification numbers only.

"**Datum.**—All elevations determined by the United States Geological Survey and United States Coast and Geodetic Survey are referred to mean sea-level, which is the level that the sea would assume if the influence of winds and tides were eliminated. This level is not the elevation determined from the mean of the highest and the lowest tides, nor is it the half sum of the mean of all the high tides and the mean of all the low tides, which is called the half-tide level. **Mean sea-level is the average height of the water, all stages of the tide being considered.** It is determined from observations made by means of tidal gages placed at stations where local conditions, such as long narrow bays, rivers, and like features, will not affect the height of the water. To obtain even approximately correct results these observations must extend over at least one lunar month, and if accuracy is desired they must extend over several years. At ocean stations the half-tide level and the mean sea-level usually differ but little. It is assumed that there is no difference between the mean sea-levels determined from observations in the Atlantic Ocean, the Gulf of Mexico, and the Pacific Ocean.

"The connection with tidal stations for bench marks in certain areas that lie at some distance from the seacoast is still uncertain, and this fact is indicated by the addition of a letter or word to the right of the word 'Datum' on tablets and posts. For such areas corrections for published results will be made from time to time as the precise-level lines of the United States Geological Survey, the

United States Coast and Geodetic Survey, or other Government organizations are extended."

BELINGTON QUADRANGLE: BARBOUR, PRESTON, RANDOLPH, AND TUCKER COUNTIES.

(Latitude 39° 00′-39° 15′; longitude 79° 45′-80° 00′.)

Leveling by F. T. Willis and J. H. Wetzel in 1905.

From Moore Station along Western Maryland R. R. to Kerens (spur line, checked).

	Feet.
Montrose, 0.2 mile northeast of station, in second step from top of coping-stone of northeast wing wall of railroad bridge; bronze tablet stamped "1997 Adj 1903"	1,996.424
Kerens, in front of station; top of rail	1,945.8
Kerens, 350 feet south of station, in southwest bridge seat of iron bridge; bronze tablet stamped "1944 Adj 1903"	1,943.618

From Montrose west along public road.

Montrose, 1.5 miles west of, in foundation stone of east end of Mathias Skidmore's residence; aluminum tablet stamped "2049 Adj 1903"	2,048.840

CASS QUADRANGLE: POCAHONTAS AND RANDOLPH COUNTIES.

(Latitude 38° 15′-38° 30′; Longitude 79° 45′-80° 00′).

Primary leveling by E. E. Harris in 1921:

From Durbin Quadrangle south along W. Va. Pulp & Paper Co. Railroad to Cass.

Spruce Post-Office, 350 feet south of, 40 feet east of track, in top of large flat boulder; bronze tablet stamped "3853 W. Va. 1921 H 144", boulder marked "U. S. B. M. 3,852.5"	3,852.578
Reference mark, 30.6 feet north of tablet, on top of pointed boulder; chiseled square	3,853.19
Spruce Post-Office, 0.97 mile south of, 10 feet east of track, on top of ledge of rock; chiseled square, rock marked "U. S. B. M. 3,920"	3,920.01
Spruce Post-Office, 1.25 miles south of, in gap of mountain, top of east rail at switch, marked "3,937.7"	3,937.67
Spruce Post-Office, 1.55 miles southeast of, 450 feet south of mile-post C 7, west side of track, on top of boulder; chiseled square, boulder marked "U. S. B. M. 3,867.8"	3,867.81
Spruce Post-Office, 2.53 miles south of, 5.43 miles northwest of **Cass**, 350 feet south of mile-post C 6, 10 feet	

	Feet.
west of track, in top of large boulder; bronze tablet stamped "3609 W. Va. 1921 H 145", boulder marked "U. S. B. M. 3,608.8"	3,609.063
Reference mark, 71.3 feet south 10° east of tablet, on top of boulder; chiseled square	3,604.87
Cass, 4.52 miles northwest of, 30 feet north of mile-post C 5, 10 feet west of track, boulder marked "U. S. B. M. 3,379.9"	3,380.33
Cass, 3.52 miles northwest of, 10 feet east of mile-post C 4, near east end of switchback, 10 feet south of track, on top face of ledge of rock; chiseled square, rock marked "U. S. B. M. 3,158.9"	3,159.55
Cass, 2.88 miles northwest of, 40 feet east of mile-post C 3, 50 feet south of track, just west of leaning locust tree, in top of large sandstone boulder; bronze tablet stamped "2977 W. Va. 1921 H 146", boulder marked "U. S. B. M. 2,976.8"	2,977.594
Reference mark, 59.6 feet north 40° east of tablet, on top of boulder; chiseled square	2,977.81
Cass, 1.76 miles northwest of, at crossing of railroad and dirt road, 10 feet east by 10 feet north of, on top of large boulder; chiseled square, telephone-pole, marked "U. S. B. M. 2,698.3"	2,699.31
Cass, 0.99 mile northwest of, at crossing of railroad and county road, 50 feet north by 10 feet east of, in southeast corner of bridge over Leatherbark Run; copper nail and washer, bridge rail marked "U. S. B. M. 2,524.4"	2,525.63
Cass, in front of station (Chesapeake & Ohio R. R.), east face of station platform; marked "U. S. 2,441.23"; top of rail of main-line track	2,441.5
Cass, west of station (C. & O. R. R.), in northeast corner of large concrete foundation, in front of post-office and store of the Pocahontas Supply Company; bronze tablet stamped "2452 W. Va. 1921 H 152"	2,452.164
Reference mark, 45.6 feet south 25° west of tablet, in south end of lower stone step at entrance to Pocahontas Supply Company; chiseled square	2,452.68

DURBIN QUADRANGLE: POCAHONTAS AND RANDOLPH COUNTIES.

(Latitude 38° 30′-38° 45′; longitude 79° 45′-80° 00′.)

Leveling by K. E. Schlachter in 1913.

From Ward northeast along Western Maryland R. R. to Valley Bend.

Ward, in front of station; top of rail	2,052.5
Huttonsville, 1.4 miles southwest of, near third mile-post, painted rail	2,037.7
Huttonsville, at station Western Maryland R. R.; top of rail (w), painted "2024.2"	2,023.8
Mill Creek, Western Maryland R. R. bridge over Tygart	

	Feet.
River, in stone seat of, southwest corner; bronze tablet stamped "2013"	2,013.047

Primary leveling by E. E. Harris in 1921:

From Beulah, Elkins Quadrangle, south-southwest along Western Maryland Railroad to Durbin, thence along highways east to Bartow, thence northeast into Spruce Knob Quadrangle.

Beulah, 0.89 mile southwest of, 2.39 miles northeast of **Wildell**, west side of track, 250 feet south of mile-post C 142/D 18, on top of outcrop of rock; chiseled square, telegraph-pole marked "U. S. 3,114.4 B. M."	3,114.74
Wildell, 1.19 miles northeast of, west side of track, center of big cut, on ledge of rock, at base of cliff; chiseled square, rock cliff marked "U. S. 3,108.8 B. M."	3,109.08
Wildell, in front of station-sign; top of near rail, "3,056.4" marked on tie	3,056.7
Wildell, 4 feet east of station-sign, in top of concrete post; bronze tablet stamped "3056 W. Va. 1921 H 116", sign-post marked "U. S. 3,055.6 B. M."	3,055.871
Witness bench mark, 68.7 feet south 60° west of tablet, in top of square-shaped post, at southeast corner of station platform; copper nail and washer	3,056.24
Wildell, 1.03 miles southwest of, east side of track, in west root of large stump; copper nail and washer, telegraph-pole marked "U. S. 3,029.8" B. M.	3,030.05
Wildell, 2.06 miles southwest of, 2,760 feet northeast of mile-post C 147/D 13, west side of track, on ledge of rock; chiseled square, rock marked "U. S. 3,021.7 B. M."	3,021.96
Wildell, 2.97 miles southwest of, 2.18 miles northeast of **May**, 20 feet west of track, in center of small shelf, at base of rock cliff; bronze tablet stamped "3011 W. Va. 1921 H 117", rock cliff marked "U. S. 3,011.2 B. M."	3,011.443
Witness bench mark, 53 feet south 20° west of tablet, on top of boulder; chiseled square	3,008.92
May, 1.21 miles northeast of, 20 feet north of track, at west end of big cut, on top of pointed boulder; chiseled square, boulder marked "U. S. 2,983 B. M."	2,983.28
May, 0.49 mile north of, 650 feet south of mile-post C 149/D 11, east side of track, in top face of stone coping of northeast corner of concrete abutment to railroad trestle; chiseled square, guard-rail marked "U. S. 2,965.4 B. M."	2,965.67
May, in front of station-sign, "2,959.6" marked on tie; top of near rail	2,959.9
May, 0.42 mile south of, 240 feet north of mile-post C 150/D 10, west of track, on top of ledge of rock, at base of cliff; chiseled square, rock cliff marked "U. S. 2,953.7 B. M."	2,954.00
May, 0.72 mile south of, west side of track, in top face of ledge of rock at base of cliff; bronze tablet stamped "2953 W. Va. 1921 H 118", rock marked "U. S. 2,952.1 B. M."	2,952.881

	Feet.
Witness bench mark, 42.2 feet north 30° west of tablet, on rock ledge; chiseled square	2,952.34
May, 1.78 miles south of, 0.38 mile south of mile-post C 151/D 9, east side of track, inside of curve in track, on top face of rock ledge; chiseled square, rock marked "U. S. 2,945.9 B. M."	2,946.20
May, 2.73 miles south of, 0.34 mile south of mile-post C 152/D 8, west side of track, in south root of large cedar stump; copper nail and washer, stump marked "U. S. 2,927.7 B. M."	2,927.99
May, 3.2 miles south of, 1,000 feet north of mile-post C 153/D 7, in west end of south stone abutment to railroad trestle over Little River of West Fork of Greenbrier River; chiseled square, abutment marked "U. S. 2,916.7 B. M."	2,916.98
May, 3.86 miles south of, 4.61 miles north of **Olive**, 0.46 mile south of mile-post C 153/D 7, (west) east side of track, in top of large flat boulder; bronze tablet stamped "2902 W. Va. 1921 H 119", boulder marked "U. S. 2,902.2 B. M."	2,902.432
Witness bench mark, 39.8 feet north 45° west of tablet, on top of small boulder; chiseled square	2,901.80
Olive, 3.10 miles north of, west side of track, in north end of west abutment of stone culvert; chiseled square, culvert marked "U. S. 2,874.6 B. M."	2,874.90
Olive, 2.28 miles north of, west side of track, at north end of cut, on top of flat rock; chiseled square, rock marked "U. S. 2,864.8 B. M."	2,865.09
Olive, 1.89 miles north of, east side of track, on top face of large ledge of rock; chiseled square, telegraph-pole marked "U. S. 2,844.4 B. M."	2,844.68
Olive, 1.31 miles northeast of, 1,200 feet north of mile-post C 157/D 3, east side of track, in top of large sheet of rock; bronze tablet stamped "2824 W. Va. 1921 H 120", rock marked "U. S. 2,823.6 B. M."	2,823.818
Witness bench mark, 43 feet south 75° west of tablet, on top of boulder; chiseled square	2,823.53
Olive, 0.48 mile northeast of, west side of track, in top of large stump; copper nail and washer, telegraph-pole marked "U. S. 2,797 B. M."	2,797.24
Olive Station, in front of station-sign; top of near rail, end of tie marked "2,787"	2,787.2
Olive, 280 feet east of station, on stone coping of south end of abutment to railroad trestle over Mountain Lick Creek; chiseled square, stone marked "U. S. 2,784.9 B. M."	2,785.14
Olive, 0.97 mile southwest of, 1.33 miles northeast of **Durbin**, west side of track, inside of long curve, on top of outcrop of rock; chiseled square, rock marked "U. S. 2,760 B. M."	2,760.26
Durbin, 0.63 mile west of, known as **West Durbin**, on west edge of road, just south of railroad crossing, in top of large stone, in retaining wall to approach to bridge	

	Feet.
over Greenbrier River; chiseled square, marked "2,731.3"	2,731.57
Durbin, 0.63 mile west of, known as **West Durbin,** in top of west end of north abutment to highway bridge over West Fork of Greenbrier River; chiseled square, guard-rail marked "U. S. 2,732.1 B. M."	2,732.32
Durbin, in center of large stone on east side of entrance to Durbin Bank; bronze tablet stamped "2730 W. Va. 1921 H 121"	2,730.480
Witness bench mark, 83.5 feet east of tablet, on stone curbing; chiseled square	2,730.13
Durbin, 0.94 mile east of, on west edge of road to Pocahontas Tanning Company, between rails, in east end of sill at cattle-guard; copper nail and washer, telegraph-pole marked "U. S. 2,736.1 B. M."	2,736.32
Durbin, 1.65 miles east of, 0.76 mile west of **Bartow,** 60 feet east of mile-post W 97, at cattle-guard, in east end of sill between rails; copper nail and washer, telegraph-pole marked "U. S. 2,751.2 B. M."	2,751.48
Bartow, 800 feet west of station, at crossing of railroad and county road, 125 feet north by 120 feet east of road, in top of outcrop of rock, on side of hill; bronze tablet stamped "2782 W. Va. 1921 H 122"	2,782.361
Witness bench mark, 19.3 feet north 80° west of tablet, on top of outcrop of rock; chiseled square	2,783.01
Bartow, in front of station; top of near rail, end of tie marked "U. S. 2,774 B. M."	2,774.1
Bartow, 0.72 mile northeast of, 20 feet west of cattle-guard north side of track, on top of 15-inch corrugated drain pipe; chiseled square, cattle-guard marked "U. S. 2,795.6 B. M."	2,795.86
Bartow, 1.28 miles northeast of, 1.51 miles southwest of **Winterburn Station (Thornwood P. O.),** 70 feet south of railroad, west edge of county road, in west end of north abutment of bridge over East Fork of Greenbrier River; chiseled square, bridge rail marked "U. S. 2,810 B. M."	2,810.55

From Bartow southeast along highways into Spruce Knob Quadrangle near its southwest corner.

Bartow, 0.71 mile southeast of, on south edge of road, 100 feet east of highway bridge over East Fork of Greenbrier River, 100 feet west of crossroads, in west root of 20-inch maple tree; copper nail and washer, fence-post marked "U. S. 2,782.8 B. M."	2,783.09
Bartow, 1.40 miles southeast of, on west edge of sharp turn in road, on north edge of lane through gate, in center of large stump; copper nail and washer, telephone-pole marked "U. S. 2,973.8 B. M."	2,973.93
Bartow, 2.26 miles southeast of, on south edge of road on west edge of lane along top of spur, in east root of 40-inch elm tree; copper nail and washer, tree marked "U. S. 3,261.4 B. M."	3,261.43

(The 5 following levels are on Spruce Knob Quadrangle):

	Feet.
Bartow, 3.08 miles southwest of, on north edge of road, on top of ledge of rock; chiseled square, telephone-pole marked "U. S. 3,523.7 B. M."	3,523.66
Bartow, 3.95 miles southeast of, 40 feet west of road center, in saddle of road, set in top of concrete post; bronze tablet stamped "3625 W. Va. 1921 H 128", telephone-pole marked "U. S. 3,624.7 B. M."	3,624.617
Witness bench mark, 40.2 feet south of tablet, in west root of 12-inch oak tree; copper nail and washer	3,624.59
Bartow, 4.81 miles southwest of, on west edge of road, at foot of hill, across road from house, in west root of 20-inch sugar tree; copper nail and washer, telephone-pole marked "U. S. 3,696.5 B. M."	3,696.41
Bartow, 5.4 miles southeast of, in sharp turn in road, 30 feet north of lane, in east root of 12-inch oak tree; copper nail and washer, mail-box post marked "U. S. 3,906.8 B. M."	3,906.67

From Durbin south along Western Maryland Railroad into Cass Quadrangle.

Durbin, in center of large stone at southeast corner of building; bronze tablet stamped "2730 W. Va. 1921 H 121"	2,730.480
Durbin, 0.50 mile southwest of, at new Chesapeake and Ohio Railroad trestle over West Fork of Greenbrier River, in south end of west stone abutment; chiseled square, rail of bridge marked "U. S. 2,720.8 B. M."	2,721.01
Durbin, 0.98 mile southwest of, 5 feet east of track, near south end of long curve in track, on top near end of 15-inch drain pipe; chiseled square, pipe marked "U. S. 2,708.1 B. M."	2,708.33
Durbin, 1.90 miles southwest of, at crossing of railroad and second-class road, 40 feet east by 10 feet south of, on top of rock flush with ground; chiseled square, telephone-pole marked "U. S. 2,685 B. M."	2,685.19
Curbin, 2.75 miles southeast of, 0.61 mile northeast of **Boyer Station,** on east edge of railroad right of way, 50 feet north of farm road crossing, in top of boulder; bronze tablet stamped "2672 W. Va. 1921 H 148", telephone-pole marked "U. S. 2,671.7 B. M."	2,671.940
Witness bench mark, 37.5 feet south 80° west of tablet, on top of boulder; chiseled square	2,672.96

Near Boyer Station.

Boyer Station, in front of; top of rail, end of tie marked "U. S. 2,661.5"	2,661.7
Boyer Station, 0.58 mile southwest of, 10 feet east of track, on top of 15-inch drain pipe; chiseled square, rock marked "U. S. B. M. 2,653.2"	2,653.43

From **Durbin** northwest along highways to **Huttonsville** and **Mill Creek.**

	Feet.
Durbin, 0.63 mile west of, known as **West Durbin,** in top of west end of north abutment to highway bridge over West Fork of Greenbrier River; chiseled square, rail of bridge marked "U. S. 2,732.1 B. M."	2,732.32
Durbin, 1.64 miles northwest of, in forks of **Y**-road, on top of large boulder; chiseled square, log marked "U. S. 3,100.6 B. M."	3,100.67
Durbin, 2.60 miles northwest of, on west edge of road, 150 feet northwest of house, on top of large boulder, in angle in road; chiseled square, boulder marked "U. S. 3,285.1 B. M."	3,285.07
Durbin, 3.35 miles northwest of, 900 feet north of dwelling, 50 feet north of road center, 10 feet west of lone oak tree; set in top near south end of large sandstone boulder; bronze tablet stamped "3299 W. Va. 1921 H 133"	3,298.649
Witness bench mark, 63 feet south 80° east of tablet, on top of boulder; chiseled square	3,297.33
Durbin, 4.10 miles northwest of, on west edge of road, north edge of small run, in line with second-class road, on top of large boulder; chiseled square, boulder marked "U. S. 3,317.9 B. M."	3,317.88
Durbin, 4.94 miles northwest of, on west edge of big bend in road, 20 feet north of small run crossing road, on top of boulder; chiseled square, boulder marked "U. S. 3,625.7 B. M."	3,625.46
Durbin, 5.44 miles northwest of, on north side of road, in gap on top of **Back Allegheny Mountain,** on top of boulder; chiseled square, telephone-pole marked "U. S. 3,756.8 B. M."	3,756.60
Durbin, 5.77 miles northwest of, 30 feet south of road center, 80 feet west of wooden culvert, in top of large boulder; bronze tablet stamped "3,691 W. Va. 1921 H 134", tree marked "U. S. 3,690.7 B. M."	3,690.512
Witness bench mark, 31 feet north 65° east of tablet, on top of boulder; chiseled square	3,689.13
Durbin, 6.62 miles northwest of, 0.7 mile southeast of **Cheat Bridge P. O.,** on east edge of road, 30 feet north of wooden culvert, on top at south end of long sandstone boulder; chiseled square, boulder marked "U. S. 3,650.8 B. M."	3,650.59
Cheat Bridge P. O., 200 feet south of, 120 feet east of county bridge over Shavers Fork of Cheat River, at east end of grass triangle formed by forks of road, on top of boulder; chiseled square, telephone-pole marked "U. S. 3,557.6 B. M."	3,557.48
Cheat Bridge P. O., 200 feet south of, 25 feet east of road, at forks of, on top of boulder; chiseled square	3,558.86
Cheat Bridge P. O., 1.22 miles northwest of, 100 feet south of road center, 130 feet southwest of gap, 70 feet south of trail along ridge, in top of large boulder; bronze tablet stamped "3948 W. Va. 1921 H 135", boulder marked "U. S. 3,948 B. M."	3,947.713

	Feet.
Witness bench mark, 39.6 feet north 75° east of tablet, on top of boulder; chiseled square	3,942.25
Cheat Bridge P. O., 2.12 miles northwest of, on south edge of road, at west end of big bend in road, on east edge of branch of Red Run (of Shavers Fork), on top of boulder; chiseled square, boulder marked "U. S. 3,728.2 B. M."	3,728.10
Cheat Bridge P. O., 3.25 miles northwest of, on north edge of road, west edge of path north, 30 feet west of log culvert, on top of boulder; chiseled square, boulder marked "U. S. 3,745 B. M."	3,744.89
Cheat Bridge P. O., 4.23 miles northwest of, 25 feet south of road center, near west end of gap, on top of mountain at **Cromer Top,** in top of sandstone boulder; bronze tablet stamped "3798 W. Va. 1921 H 136", boulder marked "U. S. 3,798.4 B. M."	3,798.181
Witness bench mark, 25.9 feet north 60° west of tablet, on top of boulder; chiseled square	3,796.52
Cheat Bridge P. O., 5.26 miles northwest of, on east edge of road, 40 feet north of mile-post "Elkins 26", and on north edge of run, on top of large boulder; chiseled square, boulder marked "U. S. 3,413.3 B. M."	3,413.28
Cheat Bridge P. O., 6.16 miles northwest of, on east edge of road, at sharp turn in road, on top face of lower ledge of rock, at base of cliff; chiseled square, rock marked "U. S. 3,085 B. M."	3,085.19
Cheat Bridge P. O., 6.89 miles northwest of, 6.35 miles southeast of **Huttonsville,** 30 feet west of road center, 100 north of sharp turn in road just north of run, about 250 feet north of shack, on side of hill, in top of large boulder; bronze tablet stamped "2814 W. Va. 1921 H 137", tree marked "U. S. 2,814.1 B. M."	2,814.378
Witness bench mark, 31.4 feet west of tablet, on top of large boulder; chiseled square	2,809.05
Huttonsville, 5.36 miles southeast of, on west edge of road. 100 feet south of gate, on top face of ledge of rock; chiseled square, rock marked "U. S. 2,516.9 B. M."	2,517.28
Huttonsville, 4.37 miles southeast of, 1,000 feet east of **Riffle Chapel,** 25 feet south of road center, 100 feet east of wooden bridge over McGee Run, in west root of 15-inch walnut tree; copper nail and washer, tree marked "U. S. 2,331.1 B. M."	2,331.67
Huttonsville, 3.45 miles southeast of, 70 feet south of road center, 60 feet west of Riffle Creek, 700 feet west of mouth of Laurel Run, in top of concrete post; bronze tablet stamped "2229 W. Va. 1921 H 138", fence marked "U. S. 2,228.6 B. M."	2,229.112
Witness bench mark, 34 feet south 75° west of tablet, on top of flat boulder; chiseled square	2,229.37
Huttonsville, 2.55 miles southeast of, on south edge of road, 400 feet east of dwelling, in west root of 20-inch walnut tree; copper nail and washer, tree marked "U. S. 2,154 B. M."	2,154.60

Feet.

Huttonsville, 1.86 miles southeast of, on east edge of road, on north edge of lane, northeast up hillside, on top at end of 15-inch drain pipe; chiseled square, rock marked "U. S. 2,110.6 B. M." ---------- 2,110.95

Huttonsville, 1.33 miles southeast of, 30 feet west of main road, 30 feet south of cross lane, in corner of pasture, set in top of concrete post; bronze tablet stamped "2060 W. Va. 1921 H 129" ---------- 2,060.417

Witness bench mark, 35.6 feet north 10° west of tablet, in south root of 15-inch maple tree; copper nail and washer ---------- 2,060.62

Huttonsville, 0.45 mile south of, at southeast corner of new steel bridge over Tygart River, on top of large stone; chiseled square, marked "U. S. 2,029.9 B. M." ---------- 2,030.05

Huttonsville, in front of station; top of near rail, end of tie marked "U. S. 2,023.9" ---------- 2,023.9

Huttonsville, 0.51 mile north of, 0.76 mile south of **Mill Creek**, on south side of farm road crossing track, at cattle-guard, in east end of stringer between rails of narrow-gauge railroad, just east of Western Maryland Railroad; copper nail and washer, fence-post marked "U. S. 2,016.6 B. M." ---------- 2,016.52

Mill Creek, in front of station; top of rail ---------- 2,016.1

Mill Creek, Western Maryland Railroad bridge over Tygart River, in stone seat of southwest corner of; bronze tablet stamped "2,013" (Bull. 632, p. 37) ---------- 2,013.047

From Cheat Bridge southwest along Western Maryland Railroad into Cass Quadrangle.

Cheat Bridge, 200 feet south of post-office, 120 feet east of steel bridge over Shavers Fork of Cheat River, at east side of triangle formed by road forks, on top of boulder; chiseled square, marked "U. S. 3,557.6 B. M." 3,557.48

Cheat Bridge P. O., 0.90 mile southwest of, at crossing of railroad and dirt road leading to Cheat Bridge Club House, 10 feet east by 25 feet north of, on top of boulder; chiseled square, boulder marked "U. S. 3,565 B. M." ---------- 3,564.94

Cheat Bridge P. O., 1.92 miles southwest of, 10 feet west of track, at east end of big cut, on north end of long boulder; chiseled square, boulder marked "U. S. 3,580.6 B. M." ---------- 3,580.56

Cheat Bridge P. O., 2.62 miles southwest of, 1,400 feet south of mile-post C 21, west side of track, in top of large boulder; bronze tablet stamped "3588 W. Va. 1921 H 140", boulder marked "U. S. 3,588.4 B. M." ---------- 3,588.393

Witness bench mark, 19 feet south 80° west of tablet, on top of east end of boulder; chiseled square ---------- 3,588.56

Cheat Bridge P. O., 3.53 miles southwest of, 10 feet east of track, on top of boulder; chiseled square, boulder marked "U. S. 3,601.3 B. M." ---------- 3,601.24

Cheat Bridge P. O., 4.35 miles southwest of, 0.30 mile north of water-tank, 50 feet north of mile-post C 19, in top face of stringer between rails of trestle; copper nail and washer, stringer marked "U. S. 3,612.1 B. M." ------ 3,612.10

	Feet.
Cheat Bridge P. O., 5.35 miles southwest of, 30 feet north of mile-post C 18, 20 feet west of track, in top of stump; copper nail and washer, stump marked "U. S. 3,621.5 B. M."	3,621.50
Cheat Bridge P. O., 6.21 miles southwest of, 950 feet north of mile-post C 17, 10 feet east of track, in top near east end of large boulder; bronze tablet stamped "3639 W. Va. 1921 H 141", boulder marked "U. S. 3,638.5 B. M."	3,638.506
Witness bench mark, 56 feet south 20° west of tablet, on top of boulder; chiseled square	3,635.99
Cheat Bridge P. O., 7.09 miles southwest of, 1,450 feet north of mile-post C 16, 20 feet south of spring, 10 feet west of track, on top of large boulder; chiseled square, boulder marked "U. S. 3,662.8 B. M."	3,662.76
Cheat Bridge P. O., 8.16 miles southwest of, 6.80 miles north of **Spruce P. O.**, 700 feet north of coaling station at **Hopkins**, 10 feet west of track, on top of large boulder; chiseled square, boulder marked "U. S. 3,682.8 B. M."	3,682.83
Spruce P. O., 5.77 miles north of, 1,000 feet north of mile-post C 14, 530 feet south of shack, 10 feet from track, in top of large boulder; bronze tablet stamped "3702 W. Va. 1921 H 142", boulder marked "U. S. 3,701.8 B. M."	3,701.770
Witness bench mark, 158.8 feet south 45° east of tablet, on top of large boulder; chiseled square	3,702.46
Spruce P. O., 4.75 miles north of, 1,200 feet north of mile-post C 13, 10 feet west of track, on top of large boulder; chiseled square, boulder marked "U. S. 3,728.9 B. M."	3,728.95
Spruce P. O., 3.84 miles north of, 1,200 feet south of railroad trestle over Shavers Fork of Cheat River, 40 feet south of shack, 10 feet east of track, on top of large boulder; chiseled square, boulder marked "U. S. 3,738.1 B. M."	3,738.16
Spruce P. O., 2.79 miles north of, 1,250 feet north of mile-post C 11, 20 feet east of track, in top of boulder; bronze tablet stamped "3769 W. Va. 1921 H 143", boulder marked "U. S. 3,769.1 B. M."	3,769.130
Witness bench mark, 35.4 feet south of tablet, on top of boulder; chiseled square	3,768.29
Spruce P. O., 1.84 miles north of, 1,500 feet north of mile-post C 10, 700 feet north of railroad trestle over Shavers Fork of Cheat River, 10 feet east of track, on top of large boulder; chiseled square, boulder marked "U. S. 3,797.4 B. M."	3,797.46
Spruce P. O., 0.77 mile north of, 110 feet south of stream crossing, 10 feet east of track, on top of boulder; chiseled square, boulder marked "U. S. 3,829.5 B. M."	3,829.52

ELKINS QUADRANGLE: BARBOUR AND RANDOLPH COUNTIES.

(Latitude 38° 45′-39° 00′; longitude 79° 45′-80° 00′.)

Leveling in 1905, by J. H. Wetzel, and in 1907, by C. K. Alexander.

From Gilman Station south along Western Maryland R. R. to Elkins, thence west to Norton (Roaring Creek Junction), thence north to Belington.

Gilman, railroad crossing at station; top of rail	1,926.0

	Feet.
Gilman, 1,800 feet north of station, near sawmill, southeast bridge seat of iron bridge; bronze tablet stamped "Adj 1903 1926"	1,926.055
Read, in front of station; top of rail	1,918.0
Elkins, at west entrance of main building of Western Maryland Railroad, in stone step; bronze tablet stamped "1930 Adj 1903"	1,929.495
Buxton, crossing at station; top of rail	1,924.2
Elkins, 3.5 miles northwest of, in 2-inch step of southeast wing-wall of iron bridge over Tygart River; aluminum tablet stamped "1914 Adj 1903"	1,913.665
Norton (Roaring Creek Junction), road crossing; top of rail	1,864.
Norton (Roaring Creek Junction), in northeast bridge seat of Coal and Coke Railroad bridge over Tygart River; aluminum tablet stamped "1865 Adj 1903"	1,864.247
Harding, in front of station; top of rail	1,847.4
Junior Station, 1 mile south of, Beaver Creek at Weaver pumping station, iron-girder bridge, on 2-inch step of northwest abutment; aluminum tablet stamped "1738 Adj 1903"	1,737.193
Dartmoor, in front of station; top of rail	1,714.2

From Elkins south along highway to Beverly and return.

Elkins, 3 miles south of, at **Midland Schoolhouse**, in west front face of foundation, 1 foot from ground and 1 foot from southeast corner of building; aluminum tablet stamped "2003"	2,002.592
Beverly, in front face, north end of door-step of public school; aluminum tablet stamped "1973"	1,972.593

From Beverly south along highways to Valley Bend, thence west to Rich Mountain, thence north along trail and highways to Norton (Roaring Creek Junction).

Beverly, 2.5 miles south of, in top face of north side of east abutment of iron highway bridge over Tygart River at **Burnt Bridge**; aluminum tablet stamped "1960"	1,959.567
Valley Bend, at **Crawford School**, in rear of building, in face of foundation stone 3 feet west of northeast corner of building; aluminum tablet stamped "2042"	2,042.097
Pingley's house, 0.5 mile west of, west side of **Rich Mountain**, in stone at south side of road; aluminum tablet stamped "3261"	3,260.939
Fisher or **Mabie**, 2 miles south of, 150 feet north of road fork, 40 feet west of road, in top face of very large boulder; aluminum tablet stamped "2568"	2,568.126
Coalton, in south front face of foundation corner-stone in southeast corner of Junior Mercantile Co.'s store; aluminum tablet stamped "2157"	2,157.023

From Elkins east along highways and Western Maryland R. R. to Tunnel Station.

	Feet.
Canfield, 0.1 mile west of station, in top face of stone wall at south end of culvert; aluminum tablet stamped "2088"	2,087.362
Tunnel Station, in front of; top of rail	2,322.2

From Beverly east along highways to Bemis.

Bemis, 4 miles west of (8 miles east of Beverly), on west side of **Cheat Mountain**, in top face of large boulder at west side of road; aluminum tablet stamped "3277"	3,277.156

HACKER VALLEY QUADRANGLE: BRAXTON, LEWIS, RANDOLPH, UPSHUR, AND WEBSTER COUNTIES.

(Latitude 38° 30′-38° 45′; longitude 80° 00′-80° 15′).

Leveling by K. E. Schlachter in 1913.

From point near Newlon south along Baltimore & Ohio R. R. to point near Silica.

Newlon, 1.5 miles south of, at sixty-seventh mile-post, at north side of third joint north of; top of east rail, painted "2001.8"	2,001.5
Craddock, 0.1 mile north of, in east corner of south abutment of railroad bridge 67A; bronze tablet stamped "2040"	2,039.911
Arvondale Junction, on railroad bridge 70A; top of southernmost bolt in east guard-rail, painted "2238.4"	2,238.31
Arvondale Junction, 1 mile south of, 14 rails south of seventy-first mile-post, at north side of joint; top of east rail, painted "2315.3"	2,315.0

HORTON QUADRANGLE: PENDLETON, RANDOLPH, AND TUCKER COUNTIES.

(Latitude 38° 45′-39° 00′; longitude 79° 30′-79° 45′.)

Leveling by C. K. Alexander in 1907:

From Tunnel Station east and south along Western Maryland R. R. to Bemis.

Meadows, 0.2 mile west of station, 10 feet south of railroad crossing, in ledge of rock; aluminum tablet stamped "2205"	2,204.609
Bowden, 2.8 miles south of, near log house west of railroad; in top face of stone coping of culvert; aluminum tablet stamped "2311"	2,310.504
Woodrow, in front of station; top of rail	2,358.9
Montes, in southwest concrete bridge seat of iron bridge over Shavers Fork of Cheat River; aluminum tablet stamped "2420"	2,419.570

	Feet.
Bemis, in top face, east side of north abutment of wooden trestle railroad bridge over Fishinghawk Creek; aluminum tablet stamped "2576"	2,574.35

Leveling by Walter McCrea in 1919:

From east border of quadrangle near Harperton northwest along highways to Harman, thence north along Central West Virginia and Southern Railroad to Gladwin (Parsons Quadrangle.)

Bench marks stamped in 1924.

Harman, 1.4 miles east of, south side of road, in large rock; chiseled square, painted "T. B. M. 2,567"	2,564.84
Harman, in front of M. J. Roy's store, in concrete curbing; bronze tablet stamped "2,359 W. Va."	2,359.288
Harman, 1 mile north of, 380 feet south of road crossing, east side of railroad, in large rock; chiseled square, painted "T. B. M. 2,310"	2,307.27
Harman, 2.0 miles north of, north side of track, in telegraph-pole; railroad spike, "T. B. M. 2,265" painted on pole	2,262.88
Harman, 2.9 miles north of, 15 feet south of railroad track, in large boulder on bank of Dry Fork; bronze tablet stamped "2,220 W. Va."	2,220.061
Harman, 3.9 miles north of, at road crossing, west side of railroad track, in flat rock; chiseled square, "T. B. M. 2,183" painted on telegraph-pole	2,180.47
Red Creek Junction, north end of station platform, in large square post; copper nail and washer, painted "T. B. M. 2,164"	2,161.86
Red Creek Junction, 1.2 miles north of, 45 feet west of J. White's freight house, south side of track, in large pointed boulder; bronze tablet stamped "2,119 W. Va."	2,119.344
Red Creek Junction, 2.2 miles north of, 500 feet east of foot-bridge, south side of railroad track; railroad spike, in telegraph-pole painted "T. B. M. 2,090"	2,087.58
Jenningston, 0.4 mile southwest of station, north side of track, in ledge of rocks; chiseled square, "T. B. M. 2,061" painted on ledge	2,058.27
Jenningston, 1,400 feet northeast of station, 50 feet south of railroad track, northeast corner of locomotive barn, in large flat rock; bronze tablet stamped "2,035 W. Va."	2,034.730
Jenningston, 1.2 miles north of, 400 feet west of cabin, north side of track; railroad spike in telegraph-pole, painted "T. B. M. 1,996"	1,993.83
Gladwin, at north side of west end of wooden railroad bridge spanning Dry Fork, in large sandstone ledge; aluminum tablet stamped "1,943"	1,943.365

From Red Creek Junction east along highway into Onego Quadrangle.

Red Creek Junction, 0.8 mile southeast of, at intersection of roads, northeast end of culvert, in flat stone; chiseled square, painted "T. B. M. 2,236"	2,233.21

Primary leveling by E. E. Harris in 1924:

From Harman south along Central West Virginia and Southern Railroad and Horton Lumber Railroad to near south border of quadrangle, thence southwest along highways into Spruce Knob Quadrangle.

	Feet.
Harman, 1 mile north of, 380 feet south of road crossing, east side of railroad, 270 feet north of mill, in large rock; chiseled square, painted "T. B. M. 2,310"	2,307.27
Harman, in front of M. J. Roy's store, in concrete curbing; bronze tablet stamped "W. Va. 2,359"	2,359.288
Harman, 0.95 mile south of, 10 feet north of track, 230 feet east of lane crossing, 350 feet west of mile-post 9, on top of large boulder; chiseled square, telegraph-pole marked "U. S. 2,367.5 B. M."	2,367.57
Harman, 2.08 miles south of, 10 feet east of track, on south edge of lane to farmhouse, 1,400 feet north of road crossing, on top of boulder; chiseled square, telegraph-pole marked "U. S. 2,426.5 B. M."	2,426.52
Hazelwood (flag station), in front of station-sign; top of nearest rail, tie marked "U. S. 2,459.1"	2,459.2
Harman, 3.06 miles south of, 0.25 mile southwest of **Hazelwood**, and 2.32 miles north of **Job**, 10 feet west of track, in top of large boulder; bronze tablet stamped "2472 W. Va. 1921 H 97"	2,472.461
Witness bench mark, 29.1 feet south 15° west of tablet, on top of boulder; chiseled square	2,475.83
Harman, 4.14 miles south of, 1.24 miles north of **Job**, in southwest corner of railroad trestle, in sill between rails; copper nail and washer, telegraph-pole marked "U. S. 2,518.9 B. M."	2,519.00
Job, 0.17 mile north of, 15 feet west of track, 40 feet south of garden fence, in top of pine stump; copper nail and washer, telegraph-pole marked "U. S. 2,574.6 B. M."	2,574.69
Job, in front of station; top of rail, marked on tie "U. S. 2,580.1"	2,580.2
Job, 0.71 mile south of, on west side of track, at switch, top of railroad spike, in switch, marked "U. S. 2,600.4 B. M."	2,600.52
Job, 1.12 miles south of, 3.44 miles northwest of **Whitmer**, 75 feet east of track, on south side of drain, in top of boulder; bronze tablet stamped "2623 W. Va. 1921 H 98", fence marked "U. S. 2,622.8 B. M."	2,622.872
Witness bench mark, 19.3 feet south 50° east of tablet, in west root of 15-inch walnut tree; copper nail and washer	2,622.07
Whitmer, 2.44 miles northwest of, in southeast corner of railroad trestle over Dry Fork, in top of cross-beam support to; copper nail and washer, guard-rail marked "U. S. 2,651.2 B. M."	2,651.28
Gandy Station (flag stop), in front of station-sign; top of rail, "2.681.8" marked on telegraph-pole	2,681.9
Whitmer, 1.46 miles northwest of, 0.24 mile south of **Gandy Station**, east of track, in southeast corner of steel high-	

	Feet.
way bridge over Gandy Creek, in center of concrete bridge seat to; chiseled square, steel support marked "U. S. 2,693.3 B. M."	2,693.47
Whitmer, 0.47 mile northwest of, east side of track, top of iron bolt at target-switch, painted white, fence marked "U. S. 2,733.9 B. M."	2,734.04
Whitmer, in front of station; top of nearest rail of main-line track, marked "U. S. 2,759"	2,759.1
Whitmer, 0.32 mile south of station, 0.29 mile northwest of **Horton**, 50 feet west of track, 15 feet south of large sycamore tree, in top of large flat boulder; bronze tablet stamped "2780 W. Va. 1921 H 99", rock cliff marked "U. S. 2,780 B. M."	2,780.143
Witness bench mark, 16 feet north 20° west of tablet, on top of boulder; chiseled square	2,780.96
Horton, in front of station; top of nearest rail, "U. S. 2,798.6" marked on front face of station platform	2,798.75
Horton, 0.65 mile south of, 700 feet north of **Keeter School (Little Italy)**, west side of track, top of railroad spike in target-switch, painted white, "U. S. 2,840.7 B. M." marked on fence	2,840.81
Horton, 1.63 miles south of, at southeast corner of railroad trestle over Gandy Creek, in top face of 8-inch by 8-inch cross-beam support to; copper nail and washer, guard-rail marked "U. S. 2,896.2 B. M."	2,896.35
Horton, 2.60 miles south of, west side of track, east bank of Gandy Creek, in northeast corner of large boulder; chiseled square, boulder marked "U. S. 2,960.4 B. M."	2,960.60
Horton, 3.55 miles south of, 14.7 feet east of track, 670 feet north of railroad trestle over Gandy Creek, in top face of ledge of rock; bronze tablet stamped "3021 W. Va. 1921 H 100", rock marked "U. S. 3,020.4 B. M."	3,020.609
Witness bench mark, 39.6 feet south of tablet, on top of boulder, chiseled square	3,017.73
Horton, 4.58 miles south of, east side of track, (0.7 mile northeast of **White**) on top of large pointed boulder; chiseled square, boulder marked "U. S. 3,082.3 B. M."	3,082.52
Horton, 5.70 miles south of, (0.42 mile southwest of **White**), 20 feet east of track, in north root of large stump; copper nail and washer, stump marked "U. S. 3,145.6 B. M."	3,145.81
Horton, 6.36 miles south of, (1.08 miles southwest of **White**), 10 feet east of track, 25 feet south of water-tank, in top face of ledge of rock; bronze tablet stamped "3187 W. Va. 1921 H 101", rock marked "U. S. 3,187.2 B. M."	3,187.346
Witness bench mark, 25.3 feet south 15° east of tablet, on top of large boulder; chiseled square	3,186.88
Horton, 7.19 miles south of, at north end of railroad trestle, in top face of sill between tracks; copper nail and washer, guard-rail marked "U. S. 3,225.3 B. M."	3,225.55

From Job west along highways to Bowden, thence south along railroad to Flint.

	Feet.
Job, 0.17 mile north of, 15 feet west of track, 40 feet south of garden fence, in top of pine stump; copper nail and washer, telephone-pole marked "U. S. 2,574.6 B. M."	2,574.69
Job, 0.56 mile west of, on south edge of road, in sharp turn in road, on east side of stream crossing, on top of boulder; chiseled square, telephone-pole marked "U. S. 2,817.2 B. M."	2,817.28
Job, 1.26 miles west of, on east edge of road, top of boulder; chiseled square, boulder marked "U. S. 3,167.1 B. M."	3,167.21
Job, 1.74 miles west of, 50 feet south of road, in gap, in east root of 18-inch elm tree; copper nail and washer, tree marked "U. S. 3,407.4 B. M."	3,407.49
Job, 2.34 miles west of, 1.1 miles southeast of Wymer, 30 feet south of road center, 50 feet east of second-class road south through gate, in top of large sandstone boulder; bronze tablet stamped "3125 W. Va. 1921 H 107"	3,124.944
Witness bench mark, 74.4 feet north 80° west of tablet, in south root of 15-inch beech tree; copper nail and washer	3,117.67
Wymer, 0.13 mile east of, at concrete highway bridge over Laurel Fork, in south end of east abutment to; chiseled square, rail marked "U. S. 2,787.5 B. M."	2,787.55
Wymer, in front of post-office; center of road	2,833.4
Wymer, 0.90 mile west of, on north edge of right-angle turn in road, on top of 15-inch galvanized iron drain-pipe; chiseled square, fence-post marked "U. S. 3,069.7 B. M."	3,069.74
Wymer, 1.31 miles west of, 2.43 miles east of Evenwood, in low gap, 150 feet north of crossroads, in top of small boulder in pasture; bronze tablet stamped "3237 W. Va. 1921 H 108", telephone-pole marked "U. S. 3,236.9 B. M."	3,236.973
Witness bench mark, 48.9 feet south 35° west of tablet, in root of small tree; copper nail and washer	3,232.22
Evenwood, 1.59 miles east of, 150 feet west of Flannigan School, on south edge of road, in north root of large stump; copper nail and washer, stump marked "U. S. 2,893.2 B. M."	2,893.30
Evenwood, 0.60 mile east of, on north edge of road, on top face of large ledge of rock; chiseled square, ledge marked "U. S. 2,791.9 B. M."	2,791.97
Evenwood, in north end of east bridge seat of new highway bridge over Glady Fork; chiseled square, marked "2,627.2"	2,627.29
Evenwood, in north end of west bridge seat of new highway bridge over Glady Fork; chiseled square, marked "U. S. 2,627 B. M."	2,627.04
Witness bench mark, 54.6 feet south 20° west of tablet, in east root of 10-inch elm tree; copper nail and washer	2,633.67
Evenwood, 0.69 mile north of, 0.58 mile south of Alpena, on east edge of road, 30 feet north of gate to pasture, at north end of triangle formed by road forks, in top of	

	Feet.
rock ledge; bronze tablet stamped "W. Va. 1921 H 109", (destroyed); fence-post marked "U. S. 2,829 B. M." ----	2,829.020
Alpena, in northwest corner of road forks, 80 feet north of post-office, in west root of 18-inch maple tree; copper nail and washer, telephone-pole marked "U. S. 2,718.1 B. M." ----	2,718.20
Alpena, 0.86 mile west of, on south edge of road, 250 feet west of dwelling, on top of boulder; chiseled square, fence-post marked "U. S. 2,917 B. M." ----	2,917.07
Alpena, 1.67 miles west of, on west edge of road, on top of large pointed boulder; chiseled square, boulder marked "U. S. 2,820.3 B. M." ----	2,820.35
Witness bench mark, 15.9 feet north 60° east of tablet, on top of large boulder; chiseled square ----	2,847.11
Alpena, 2.42 miles west of, 2.88 miles east of **Bowden,** on west edge of road and south edge of lane west through gate, in top of boulder; bronze tablet stamped "2444 W. Va. 1921 H 100", gate-post marked "U. S. 2,443.6 B M."	2,443.681
Bowden, 0.91 mile east of, 25 feet west of road center, inside fence line, 40 feet north of forks of lane, on top of pointed boulder; chiseled square, fence-post marked "2,251.2 B. M." ----	2,251.29
Bowden, 0.55 mile southeast of, on west side of track, W. M. R. R., on top of large boulder; chiseled square, boulder marked "U. S. 2,230 B. M." ----	2,230.09
Bowden, 250 feet east of station, 40 feet south of track, on high bank, set in top of large sandstone boulder; bronze tablet stamped "2226 W. Va. 1921 H", boulder marked "U. S. 2,225.9 B. M." ----	2,225.959
Witness bench mark, 19.3 feet north 70° east of tablet, on top of boulder; chiseled square ----	2,228.13
(Old P. B. M. at Bowden destroyed in railroad improvements.)	
Bowden, 1.47 miles south of, 25 feet east of track, on top of large boulder; chiseled square, rock cliff marked "U. S. 2,255.3 B. M." ----	2,255.36
Bowden, 2.21 miles south of, 0.70 mile north of **Weese,** 15 feet west of track, on top of boulder; chiseled square, boulder marked "U. S. 2,285.2 B. M." ----	2,285.24
Weese, 31 feet north of north end of station platform, west side of track, in center of stone coping of culvert; bronze tablet stamped "2311 W. Va. 1921 H", culvert marked "U. S. 2,311 B. M." ----	2,311.327
Witness bench mark, 31 feet south of tablet, in top of post, at northeast end of station platform; copper nail and washer ----	2,313.44
Weese, 1.09 miles south of, 0.40 mile north of **Woodrow,** west side of track, top of ledge of rock; chiseled square, ledge marked "U. S. 2,345 B. M." ----	2,345.01
Woodrow, in front of station-sign; top of nearest rail of main-line track ----	2,348.2

	Feet.
Woodrow, 0.71 mile south of, 0.43 mile north of **Flint**, at northwest corner of railroad trestle over run, top of iron bolt, painted white, guard-rail marked "U. S. 2,378.2 B. M."	2,378.25
Flint, in front of station-sign; top of nearest rail of main-line track	2,408.4
Flint, 0.6 mile south of, in south end of west concrete bridge seat of railroad bridge over Shavers Fork at **Montes** (bridge now abandoned); aluminum tablet stamped "W. Va. 2,420" (Bull. 632, p. 24)	2,419.570

From Evenwood northeast along highways (formerly lumber railroad) to Gladwin, Parsons Quadrangle.

Evenwood, 1.11 miles northeast of, east side of track, on top of boulder; chiseled square, boulder marked "U. S. 2,598.4 B. M."	2,598.48
Evenwood, 2.13 miles northeast of, south side of track, on top of boulder; chiseled square, boulder marked "U. S. 2,570.9 B. M."	2,571.02
Evenwood, 2.63 miles northeast of, 8 feet west of track, in top face of ledge of rock flush with ground; bronze tablet stamped "2553 W. Va. 1921 H 111", rock cliff marked "U. S. 2,553.3 B. M."	2,553.337
Witness bench mark, 44.5 feet north 30° east of tablet, on top of ledge of rock; chiseled square	2,555.48
Evenwood, 3.57 miles northeast of, north side of track, 20 feet east of target-switch, in west root of large stump; copper nail and washer, stump marked "U. S. 2,529.5 B. M."	2,529.57
Evenwood, 4.44 miles northeast of, south side of track, in north root of large stump; copper nail and washer, stump marked "U. S. 2,495 B. M."	2,495.08
Evenwood, 5.32 miles northeast of, south side of track, just east of drain, on top face of large ledge of rock; chiseled square, rock marked "U. S. 2,468.4 B. M."	2,468.53
Evenwood, 6.24 miles northeast of, 300 feet west of dwelling, south side of track, in top face of large boulder; bronze tablet stamped "2421 W. Va. 1921 H 112", boulder marked "U. S. 2,420.6 B. M."	2,420.700
Witness bench mark, 57.7 feet north 40° east of tablet, in east root of large stump; copper nail and washer	2,419.12
Evenwood, 7.24 miles northeast of, east of track, in top face of ledge of rock; chiseled square, rock marked "U. S. 2,369.8 B. M."	2,369.91
Evenwood, 8.32 miles northeast of, 0.52 mile northwest of water-tank, at east end of railroad trestle, in end of stringer between rails; copper nail and washer, guard-rail marked "U. S. 2,321.2 B. M."	2,321.34
Evenwood, 9.21 miles northeast of, east side of track, in north root of large stump; copper nail and washer, stump marked "U. S. 2,283.6 B. M."	2,283.74
Evenwood, 9.91 miles northeast of, 7.20 miles southwest of **Gladwin**, 15 feet west of track, in top face of ledge of	

	Feet.
rock; bronze tablet stamped "2260 W. Va. 1921 H 113", rock marked "U. S. 2,260 B. M."	2,260.165
Witness bench mark, 116.8 feet east of tablet, on top boulder; chiseled square	2,258.69
Gladwin, 6.17 miles southwest of, north side of track, on top face of ledge of rock; chiseled square, rock marked "U. S. 2,219 B. M."	2,219.17
Gladwin, 5.15 miles southwest of, north side of track, on top face of ledge of rock; chiseled square, telegraph-pole marked "U. S. 2,185.5 B. M."	2,185.72
Gladwin, 4.61 miles southwest of, north side of track, at east end of cliff, on top face of ledge of rock; chiseled square, rock marked "U. S. 2,171.6 B. M."	2,171.81
Gladwin, 3.74 miles southwest of, west side of track, in top face of ledge of rock, 3 feet above track; bronze tablet stamped "2137 W. Va. 1921 H 114", rock cliff marked "U. S. 2,136.9 B. M."	2,137.039
Witness bench mark, 51.5 feet north 70° west of tablet, at base of cliff; chiseled square	2,135.26
Gladwin, 2.99 miles southwest of, at northwest corner of railroad trestle over Glady Fork, in end of stringer between rails; copper nail and washer, guard-rail marked "U. S. 2,102.6 B. M."	2,102.77
Gladwin, 2.06 miles southwest of, west side of track, on top of long pointed boulder; chiseled square, boulder marked "U. S. 2,052.5 B. M."	2,052.68
Gladwin, 1.04 miles southwest of, west side of track, on top face of ledge of rock; chiseled square, rock marked "U. S. 1,999.6 B. M."	1,999.76

From point 5 miles northwest of Osceola, Spruce Knob Quadrangle, northwest along highways to Bemis.

Osceola, 6.41 miles northwest of, 4.91 miles southeast of **Glady, top of Middle Mountain**, 15 feet east of road, in gap, in west root of 15-inch hickory tree; copper nail and washer, tree marked "U. S. 3,680.8 B. M."	3,681.07
Glady, 3.79 miles southeast of, on east edge of road, 60 feet south of trail up hollow, on top of small boulder, in angle of road; chiseled square, tree marked "U. S. 3,400.1 B. M."	3,400.37
Glady, 3.20 miles southeast of, 25 feet north of road center, 35 feet east of run crossing road, in top of large boulder; bronze tablet stamped "3129 W. Va. 1921 H 105", boulder marked "U. S. 3,128.8 B. M."	3,129.086
Witness bench mark, 36.9 feet south 80° west of tablet, in south root of 30-inch elm tree; copper nail and washer	3,125.81
Glady, 2.21 miles southeast of, 50 feet north of road, 60 feet west of East Fork of Glady Fork, 200 feet east of crossing of log railroad and dirt road, in root of large stump; copper nail and washer, stump marked "U. S. 2,924.3 B. M."	2,924.56

	Feet.
Glady, 1.21 miles southeast of, 10 feet west of track, 50 feet south of second-class road crossing, in east root of large stump; copper nail and washer, stump marked "U. S. 2,876.4 B. M."	2,876.67
Glady, 0.59 mile southeast of, at railroad trestle over East Fork of Glady Fork in end of stringer between rails; copper nail and washer, guard-rail marked "U. S. 2,854.4 B. M."	2,854.67
Glady, 0.50 mile north of railroad station, 200 feet west of **Glady School**, on high bank, 80 feet west of Glady-Evenwood road, 20 feet north of Glady-Bemis road, in top of large boulder; bronze tablet stamped "2874 W. Va. 1921 H 106", fence-post marked "U. S. 2,874.1 B. M."	2,874.452
Witness bench mark, 36.3 feet north 20° east of tablet, on top of large boulder; chiseled square	2,880.19
Glady, 0.91 mile west of, 1.19 miles east of **Bemis**, in northeast corner of road forks, on top of ledge of rock; chiseled square, rock marked "U. S. 2,883.7 B. M."	2,884.06
Bemis, 0.44 mile east of, at new concrete highway bridge over Shavers Fork of Cheat River, on top of north end of west abutment to; chiseled square, marked "U. S. 2,587.7 B. M."	2,588.08
Bemis, in front of station; top of nearest rail	2,586.6
Bemis, in top face, east side of north abutment of wooden trestle railroad bridge over Fishinghawk Creek; aluminum tablet stamped "2,574"	2,574.350

From Glady southwest along Western Maryland Railroad into Elkins Quadrangle near its southeast corner.

Glady, 0.50 mile north of Western Maryland Railroad station, 200 feet west of **Glady School**, 80 feet west of Glady-Evenwood road, 20 feet north of Glady-Bemis road, 6 feet north of fence line, in top of large boulder, on high bank; bronze tablet stamped "2874 W. Va. 1921 H 106"	2,874.452
Witness bench mark, 36.3 feet north 20° east of tablet, on top of large boulder; chiseled square	2,880.19
Glady, in front of station; top of nearest rail, "2,913.3" marked on tie	2,913.6
Glady, 0.54 mile southwest of, west side of track, in end of cross-beam of target-switch; top of iron spike, painted white, fence marked "U. S. 2,942 B. M."	2,942.30
Glady, 1.54 miles southwest of, 30 feet northwest of track, on highest point of large outcrop of rock; chiseled square, rock marked "U. S. 2,993.2 B. M."	2,993.49
Glady, 2.58 miles southwest of, 0.86 mile northeast of **Beulah**, 42 feet west of track, in large sandstone boulder; bronze tablet stamped "3035 W. Va. 1921 H 115", boulder marked "U. S. 3,034.5 B. M."	3,034.850
Witness bench mark, 38 feet south 25° west of tablet, on top of boulder; chiseled square	3,041.43

MINGO QUADRANGLE: POCAHONTAS, RANDOLPH, AND WEBSTER COUNTIES.

(Latitude 38° 15′-38° 30′; longitude 80° 00′-80° 15′).

Primary leveling by E. E. Harris in 1921 and P. E. Davenport in 1922:

From near Marlinton, Marlinton Quadrangle, north along highways to near Slaty Fork Post-Office. Part of an unadjusted line closing 0.948 feet high.

(This line was releveled in 1923, partly by H. R. Kilmer and partly by R. C. Seitz, without finding error. Additional leveling should be done to reduce errors in the two circuits of Mingo Quadrangle of nearly 1 foot each).

	Feet.
Marlinton, 2.87 miles north of, on west edge of road, on north edge of a dim road to southwest, 10 feet west of corner fence-post, in south root of large stump; copper nail and washer, fence-post marked "U. S. B. M. 2,500.8"	2,501.06
Marlinton, 3.46 miles north of, 0.62 mile south of **Edray**, 4.33 miles east of **Woodrow**, at forks of T-road west, 40 feet west by 60 feet south of, 15 feet south of small store, in yard of L. J. Moore, set in top of concrete post; bronze tablet stamped "W. Va. 1921 H 177", telephone-pole marked "U. S. B. M. 2,501.5"	2,501.795
Reference bench mark, 43.6 feet south 40° west of tablet, in east root of 8-inch locust tree; copper nail and washer	2,502.73
Edray, 400 feet south of post-office, in forks of Y-road, in center of top of concrete culvert; chiseled square, culvert marked "U. S. B. M. 2,409.2"	2,409.49
Edray, 1.01 miles north of, on north edge of road, in south root of 30-inch chestnut tree; copper nail and washer, tree marked "U. S. B. M. 2,706.5"	2,706.76
Edray, 1.82 miles north of, 30 feet east of road center, 10 feet east of wire fence line, 50 feet south of rail fence line, on side of cleared hill, in top of rock set in place; bronze tablet stamped "W. Va. 1921 H 178", telephone-pole marked "U. S. B. M. 3,026.6" (not found, 1923)	3,026.742
Reference mark, 35.4 feet west of tablet, on top of ledge of rock; chiseled square (not found, 1923)	3,028.54
Edray, 2.99 miles north of, in gap of **Red Lick Mountain**, 40 feet west of center and 50 feet south of cross lane, in east root of 24-inch oak tree; copper nail and washer, tree marked "U. S. B. M. 3,539.4"	3,539.42
Edray, 4.02 miles north of, 0.54 mile south of **Crooked Fork School**, 40 feet west of road center, at southeast corner of private garage, in north root of 15-inch oak tree; copper nail and washer, tree marked "U. S. B. M. 3,166.3"	3,166.46
Edray, 5.04 miles north of, 0.48 mile north of **Crooked Fork School**, 40 feet west of sharp turn in road, in top of large sandstone boulder; bronze tablet stamped "W. Va. 1921 H 179"	3,064.333
Reference mark, 95 feet north 25° east of tablet, on top of pointed boulder; chiseled square	3,061.26
Edray, 6.01 miles north of, on east edge of angle in road, 40	

	Feet.
feet south of gate, on east edge of long outcrop of rock; chiseled square, boulder marked "U. S. B. M. 3,014.8"	3,015.10
Edray, 6.68 miles north of, 850 feet south of New Pleasant Valley School, on west edge of road, in line with T-road east, on top of boulder; chiseled square, fence-post marked "U. S. B. M. 2,957.7"	2,958.12
Edray, 7.64 miles north of, 40 feet north of road center, 55 feet east of Marys Chapel, 2 feet west of fence line, in top of large sandstone boulder; bronze tablet stamped "W. Va. 1921 H 180", fence marked "U. S. B. M. 2,949.9"	2,950.309
Reference mark, 41.6 feet north 40° west of tablet, on top of sandstone boulder; chiseled square	2,950.99
Edray, 8.53 miles north of, 0.88 mile northwest of Marys Chapel, 0.46 mile south of Hannah School, on east edge of road, at foot of hill and on south side of drain, in west root of 24-inch oak tree; copper nail and washer, tree marked "U. S. B. M. 2,909.8"	2,910.18
Edray, 9.60 miles north of, 0.61 mile northwest of Hannah School, on west edge of road, 130 feet north of run crossing road, on east side of gate, on top of boulder; chiseled square, fence marked "U. S. B. M. 2,858.3"	2,858.79
Edray, 10.73 miles north of, 80 feet north of road, 40 feet south of crest of hill, overlooking Old Field Fork, 4 feet east of lone tree, in top of large sandstone boulder; bronze tablet stamped "W. Va. 1921 H 181", telephone-pole marked "U. S. B. M. 2,818.2"	2,818.489
Reference mark, 52.4 feet north 40° east of tablet, on top of sandstone boulder; chiseled square	2,820.09
Edray, 11.32 miles north of, 0.80 mile south of Luther D. Sharp's store, on west edge of road, on top of boulder; chiseled square, boulder marked "U. S. B. M. 2,787.1"	2,787.46
Edray, 12.10 miles north of, 240 feet south of Luther D. Sharp's store, in center of east concrete parapet wall to bridge over Slaty Fork; chiseled square, wall marked "U. S. B. M. 2,809.2"	2,809.53
Slaty Fork P. O., 1.29 miles east of, 4.01 miles west of Linwood, 0.50 mile north of Luther D. Sharp's store, on south edge of road, 60 feet west of road forks, in top face of long ledge of rock; bronze tablet stamped "W. Va. 1921 H 182", rock ledge marked "U. S. B. M. 2,799.5". (Unadjusted)	2,799.852
(Adjusted elevation)	2,798.908

From near Slaty Fork P. O., north along highways into Pickens Quadrangle.

Primary leveling by E. E. Harris in 1921 and P. E. Davenport in 1922: (An excessive adjustment has been made in this line).

Slaty Fork P. O., 1.29 miles east of, 4.01 miles west of Linwood, 0.50 mile north of Luther D. Sharp's store, on south edge of road, 60 feet west of road forks, in top face of long ledge of rock; bronze tablet stamped "W. Va. 1921 H 182", rock ledge marked "U. S. B. M. 2,799.5"	2,798.908
Reference mark, 45.5 feet north 70° east of tablet, on rock ledge; chiseled square	2,795.96

	Feet.
Slaty Fork P. O., 200 feet south of, on east edge of road, in west root of 30-inch oak tree; copper nail and washer, tree marked "U. S. B. M. 2,671.3"	2,670.68
Slaty Fork P. O., 1.28 miles north of, 1,970 feet north of mile-post C 23, 20 feet east of track, at base of rock cliff, at south end of big cut, on top of face of ledge of rock; chiseled square, rock marked "U. S. 2,623.2 B. M."	2,622.36
Slaty Fork P. O., 2.35 miles north of, 2,400 feet north of mile-post C 24, 35 feet west of track, 100 feet north of shanty, in top of boulder below track; bronze tablet stamped "W. Va. 1921 H 183", boulder marked "U. S. B. M. 2,577.3"	2,576.444
Reference mark, 49.5 feet north 20° west of tablet, on top of boulder; chiseled square	2,580.30
Slaty Fork P. O., 3.33 miles north of, 2,240 feet north of mile-post C 25, 10 feet west of track, on top of pointed boulder; chiseled square, boulder marked "U. S. B. M. 2,547.5"	2,546.51
Slaty Fork P. O., 4.37 miles north of, 1,260 feet south of Blackhole Run, 2,900 feet north of railroad trestle over Elk River, 20 feet east of track, on top of boulder; chiseled square, boulder marked "U. S. B. M. 2,523.4"	2,522.35
Slaty Fork P. O., 5.33 miles north of, 49 feet east of track, 80 feet northeast of gate to farmhouse of Hanson Hamrick, in west end of large boulder, in open field; bronze tablet stamped "W. Va. 1921 H 184", telegraph-pole marked "U. S. B. M. 2,488.3"	2,487.150
Reference mark, 81.0 feet north 20° west of tablet, on top of boulder; chiseled square	2,485.44
Slaty Fork P. O., 6.27 miles north of, 2,060 feet north of mile-post C 28, 900 feet north of shanty and warehouse, 10 feet east of track, on top of large boulder; chiseled square, boulder marked "U. S. B. M. 2,453.4"	2,452.27
Slaty Fork P. O., 7.37 miles north of, 40 feet east of track, 430 feet north of railroad switch, in top of large sandstone boulder; bronze tablet stamped "W. Va. 1921 H 185", boulder marked "U. S. B. M. 2,391.6"	2,390.422
Reference mark, 116.8 feet north 40° west of tablet, on top of boulder; chiseled square	2,389.68

From Edray west along highways to Williams River. (Double spur line based upon unadjusted line north from Marlinton).

Woodrow, 3.50 miles east of, on south edge of road, 60 feet east of road forks, at **Onoto,** in center of parapet wall of new concrete bridge over Dry Creek; chiseled square, wall of bridge marked "U. S. B. M. 2,351"	2,351.38
Woodrow, 2.80 miles east of, 40 feet west of road center, on north edge of second-class road west, 100 feet south of **Pine Grove School,** in south root of 20-inch oak tree; copper nail and washer, tree marked "U. S. B. M. 2,500"	2,500.30
Woodrow, 1.88 miles east of, on south edge of road, just east of angle in road, at foot of hill, on top of large boulder; chiseled square, boulder marked "U. S. B. M. 2,520.7"	2,520.98
Woodrow, 1.88 miles east of, 40 feet south of road center, 150 feet east of gate, in top of boulder; bronze tablet	

Feet.

stamped "W. Va. 1921 H 191", telephone-pole marked "U. S. B. M. 2,520.3" ---- 2,520.522

Reference mark, 47 feet north 75° west of tablet, on top of boulder; chiseled square ---- 2,521.88

Woodrow, 1.08 miles southeast of, 0.34 mile west of **West Union Church**, north edge of road, on top of rock, at base of cliffs; chiseled square, rock marked "U. S. B. M. 2,800" ---- 2,800.13

Woodrow, 0.48 mile southeast of, in southwest corner of forks of lane, on top of boulder; chiseled square, telephone-pole marked "U. S. B. M. 2,992.1" ---- 2,992.06

Woodrow, center of road in front of post-office, "3,202" marked on rock ---- 3,202.

Reference mark, 186 feet south and 20 feet west of tablet, on east edge of road, on top of large flat boulder; chiseled square ---- 3,204.87

Woodrow, 430 feet north of post-office, 300 feet southeast of forks of road, 80 feet east of road center, in top of large boulder; bronze tablet stamped "W. Va. 1921 H 192", telephone-pole marked "U. S. B. M. 3,209.7" ---- 3,209.536

Woodrow, 0.67 mile northwest of, 30 feet north of road center, 50 feet east of church, in south root of 15-inch oak tree; copper nail and washer, tree marked "U. S. B. M. 3,215.9" ---- 3,215.76

Woodrow, 1.35 miles northwest of, on west edge of road, 70 feet south of gate across road, in east root of 8-inch poplar tree; copper nail and washer, tree marked "U. S. B. M. 3,215.5" ---- 3,215.43

Woodrow, 2.32 miles northwest of, on east edge of road, 300 feet south of run crossing road, on top of large boulder; chiseled square, boulder marked "U. S. B. M. 3,171" ---- 3,170.99

Woodrow, 2.89 miles northwest of, 20 feet east of road center, 30 feet north of run crossing road, in top of large boulder; bronze tablet stamped "W. Va. 1921 H 193", tree marked "U. S. B. M. 3,118.5" ---- 3,118.536

Reference mark, 45.7 feet north of tablet, in west root of 6-inch oak tree; copper nail and washer ---- 3,120.97

Woodrow, 3.71 miles northwest of, 60 feet south of road center, at point where road drops off to Williams River, top of cleared hill, in north root of 6-inch cherry tree; copper nail and washer, tree marked "U. S. B. M. 3,178.7" ---- 3,178.75

From near Slaty Fork P. O. along highways east and north into Pickens Quadrangle.

Edray, 12.60 miles north of, 1.29 miles east of **Slaty Fork P. O.**, 4.01 miles west of **Linwood**, on south edge of road, 60 feet west of road forks, in top of long ledge of rock; bronze tablet stamped "W. Va. 1921 H 182", rock ledge marked "U. S. B. M. 2,799.5" ---- 2,798.908

Reference mark, 45.5 feet north 70° east of tablet, on rock ledge; chiseled square ---- 2,795.96

Linwood, 3.07 miles west of, on south edge of road, 30 feet east of run and about 80 feet northwest of house on hill-

	Feet.
side, on top of ledge of rock; chiseled square, post marked "U. S. T. B. M. 2,868.8"	2,868.18
Linwood, 2.31 miles west of, on north edge of road, 15 feet east of gate and 150 feet west of lane to house, in south root of 25-inch oak tree; copper nail and washer, tree marked "U. S. B. M. 2,819.5"	2,818.86
Linwood, 1.65 miles west of, on south side of road, at base of east end of parapet wall of new concrete bridge over Big Spring Fork; chiseled square, wall marked "U. S. B. M. 2,846.9"	2,846.28
Linwood, 0.85 mile west of, on north edge of road, on top of rock ledge; chiseled square, telephone-pole marked "U. S. B. M. 2,896.7"	2,896.07
Linwood, 500 feet west of post-office, 250 feet west of T-road south, on north edge of angle in road, in top face of ledge of rock; bronze tablet stamped "W. Va. 1921 H 198", shed marked "U. S. B. M. 2,943.1"	2,942.397
Reference mark, 68.8 feet south 75° east of tablet, on top of boulder; chiseled square	2,940.43
Linwood, 1.17 miles north of, on west edge of sharp turn in road, on top of large flat boulder, on north edge of run; chiseled square, boulder marked "U. S. B. M. 3,242"	3,241.24
Linwood, 1.87 miles north of, in gap of **Middle Mountain**, in southwest corner of crossing of Western Maryland Railroad and county road, in east root of 18-inch oak tree; copper nail and washer, telephone-pole marked "U. S. B. M. 3,501.8"	3,501.03
Linwood, 2.79 miles north of, 10 feet south of track, 20 feet east of water-tank, on top of large boulder; chiseled square, boulder marked "U. S. B. M. 3,581.4"	3,580.61
Linwood, 3.59 miles north of, 3.55 miles south of **Mingo**, at **Mace**, 200 feet north of lane to, on west edge of road, in top face of rock ledge; bronze tablet stamped "W. Va. 1921 H 199", telephone-pole marked "U. S. B. M. 3,464.4"	3,463.582
Reference mark, 58 feet north 10° west of tablet, on top of rock ledge; chiseled square	3,460.25
Mingo, 2.51 miles southeast of, on east edge of road, at southwest corner of old **Fairview School** (now abandoned), in west root of forked oak tree; copper nail and washer, telephone-pole marked "U. S. B. M. 3,102.4"	3,101.85
Mingo, 1.74 miles south of, on south edge of sharp turn in road, 300 feet south of new **Fairview School**, on west edge of private lane and 60 feet east of second-class road, on top of rock ledge; chiseled square, rock marked "U. S. B. M. 2,993"	2,992.48
Mingo, 0.87 mile south of, on east edge of road, top of rise, in top face of concrete foundation of iron gate to fence around memorial monument; chiseled square, telephone-pole marked "U. S. B. M. 3,037.2"	3,036.72
Mingo, 0.51 mile south of post-office, 50 west of road, 50 feet north of old church (now abandoned) at **Upper Mingo**, in top of large boulder; bronze tablet stamped "W. Va. 1921 H 200", rock marked "U. S. B. M. 2,691.7"	2,691.396

Feet.

Reference mark, 38.2 feet north 85° east of tablet, in west root of 18-inch oak tree; copper nail and washer 2,689.34

Mingo, at south end of steps at entrance to post-office, on top of large flat boulder; chiseled square, telephone-pole marked "U. S. B. M. 2,638.8" 2,638.54

Mingo, 1.06 miles northwest of, 3.5 miles southeast of **Monterville**, 40 feet west of road, 150 feet north of barn, (in Pickens Quadrangle), in south root of 10-inch apple tree; copper nail and washer, tree marked "U. S. B. M. 2,961.1" 2,960.80

From Linwood southeast along highways to near Clover Lick, Cass Quadrangle.

Primary leveling by P. E. Davenport in 1922:

Linwood, 500 feet west of post-office, 250 feet west of T-road south, on north edge of angle in road, in top face of ledge of rock; bronze tablet stamped "W. Va. 1921 H 196", shed marked "U. S. B. M. 2,943.1" 2,942.397

Linwood, 1.1 miles southeast of, in limestone rock, on south margin of road; rock painted "U. S. 3,036.3", chiseled square 3,035.33

Wooddell mail-box, center of road 3,110.0

Linwood, at creek, 1.8 miles east of 3,091.9

Linwood, 2.09 miles southeast of, in large limestone rock, on side of road; chiseled square, rock painted "U. S. B. M. 3,111.2" 3,110.16

Yewglade School, in front of; ground 3,125.5

Linwood, 2.8 miles southeast of, in small rock, on east side of road, north of rock; chiseled square, painted "U. S. B. M. 3,322.8" 3,321.87

Linwood, 3.27 miles southeast of, 7 feet north of north gate-post, 25 feet west of center of road, in pasture of O. A. Bell, on point of **Cloverlick Mountain**, on concrete post; bronze tablet stamped "W. Va. D 1", mail-box painted "U. S. B. M. 3,502.5" 3,501.458

Reference mark, in stump of locust tree, on west side of road, 38 feet southeast of post; copper nail and washer 3,499.14

Stone, west side of road, painted "3,326" 3,325.4

Linwood, 4.15 miles southeast of, 1.4 miles east of **Gibson Knob**, in sandstone rock, on east edge of road; chiseled square, painted "U. S. B. M. 3,078.5" 3,077.57

Linwood, 5.04 miles southeast of, 5.25 miles northwest of **Clover Lick**, in old gate-post, on west side of road; copper nail and washer, gate painted "U. S. B. M. 2,611.6" 2,610.78

Sharp curve in road, pole, painted "2,526" 2,524.8

Linwood, 6.13 miles southeast of, 4.15 miles northwest of **Clover Lick**, on small sandstone rock, on west side of road, at cattle-scale side of shed, painted "U. S. B. M. 2,513.1", chiseled square 2,512.25

	Feet.
Clover Lick, 3.36 miles northwest of, 45 feet south 30° east of center of road, 47 feet west of 24-inch oak tree on north bank of Cloverlick Creek, in flint rock; bronze tablet stamped "W. Va. D", elevation painted on large rock on north side of road "U. S. B. M. 2,408.9"	2,408.078
Reference mark, in north root of 24-inch oak tree, 47 feet east of tablet, 25 feet north of Cloverlick Creek, 200 feet west of gate in fence corner; copper nail and washer	2,408.70
At old abandoned schoolhouse, elevation painted "2,389"	2,388.8

Primary leveling by E. E. Harris in 1921:

From Cass Quadrangle southwest along Chesapeake and Ohio Railroad across southeast corner of quadrangle into Marlinton Quadrangle.

Big Run, 0.76 mile southwest of, 20 feet south of mile-post W 66, east side of track, in top of rack for extra rail; copper nail and washer, telegraph-pole marked "U. S. B. M. 2,237.4"	2,237.64
Big Run, 1.75 miles southwest of, 0.44 mile northeast of **Harter**, 20 feet east of mile-post W 65, 10 feet south of track, in top of rack for extra rail; copper nail and washer (rock marked), base of mile-post marked "U. S. B. M. 2,221.2"	2,221.50
Harter, in front of station-sign; top of near rail, end of tie marked "U. S. 2,210.3"	2,210.6
Harter, 1,740 feet southwest of station, 1,200 feet north of mile-post W 64, 15 feet east of track, on top face of ledge of rock; bronze tablet stamped "W. Va. 1921 H 157", rock marked "U. S. B. M. 2,205.6"	2,205.845
Reference mark, 56.3 feet south 15° east of tablet, on top of boulder; chiseled square	2,205.85
Harter, 1.25 miles southwest of, 0.90 mile east of **Clawson**, 1,620 feet north of mile-post W 63, 10 feet east of track, at base of leaning boulder; chiseled square, boulder marked "U. S. B. M. 2,196.2"	2,196.49
Clawson, in front of station-sign; top of rail, end of tie marked "U. S. B. M. 2,185.3"	2,185.6
Clawson, 70 feet south of station-sign, 60 feet west of track, in east root of pear tree; copper nail and washer, tree marked "U. S. B. M. 2,182.3"	2,182.58
Thorny Creek, in front of station-sign; top of near rail; end of tie marked "U. S. 2,174.4"	2,174.6
Thorny Creek, 500 feet south of station, 0.95 mile northeast of **August**, 1,000 feet north of mile-post W 61, 40 feet west of track, in top of boulder below track; bronze tablet stamped "W. Va. 1921 H 158", rock marked "U. S. B. M. 2,166.4"	2,166.683
Reference mark, 81 feet south 40° west of tablet, in east root of 6-inch maple tree; copper nail and washer	2,167.58

ONEGO QUADRANGLE: GRANT, PENDLETON, RANDOLPH, AND TUCKER COUNTIES.

(Latitude 38° 45′-39° 00′; longitude 79° 15′-79° 30′).

Leveling by Walter McCrea in 1919:

From Mouth of Seneca along highways northwest to Days Mill (Harperton Post-Office).

(Line enters Horton Quadrangle.)

	Feet.
Mouth of Seneca Post-Office, 200 feet north of post-office, at intersection of roads, in large boulder; bronze tablet stamped "1,569 W. Va."	1,566.588
Mouth of Seneca Post-Office, 1.0 mile west of, north side of road, in large rock: chiseled square, "T. B. M. 1,748" painted on rock	1,745.55
Mouth of Seneca Post-Office, 2 miles west of, 400 feet west of road leading south, south side of road, in large boulder; chiseled square, "T. B. M. 1,757" painted on boulder	1,754.88
Onego, 30 feet north of J. R. Adamson's store, 100 feet south of Roaring Creek, east side of road, in large boulder; bronze tablet stamped "1,764 W. Va."	1,761.139
Onego, 1.0 mile northwest of, opposite Luther Hoffman's dwelling, 15 feet west of road, in large flat rock; chiseled square, marked "T. B. M. 1,841"	1,838.82
Onego, 2.0 miles northwest of, north side of road, in large boulder; chiseled square, boulder marked "T. B. M. 1,929"	1,926.88
Onego, 3.1 miles northwest of, 500 feet south of wooden bridge over McIntosh Run of Horsecamp Run of Seneca Creek, east side of road, in large flat rock; bronze tablet stamped "2,170 W. Va."	2,167.501
Onego, 4.1 miles northwest of, in ledge of rocks, east side of road; chiseled square, "T. B. M. 2,661" painted on rocks	2,658.71
Onego, 5.2 miles northwest of, 700 feet south of road leading east, west side of road, in small rock; chiseled square, "T. B. M. 3,212" painted on telephone-pole	3,209.06
Onego, 6.4 miles northwest of, 250 feet east of road leading south, north of road, in large boulder; bronze tablet stamped "2,977 W. Va."	2,974.180
Harperton Post-Office, 15 feet west of J. C. Harman and Company's store, north side of road, in large boulder; chiseled square, "T. B. M. 2,752" painted on boulder	2,750.02

From west border of quadrangle east along highways to point 1.0 mile southwest of (New) Hopeville.

Red Creek Junction, 1.8 miles southeast of, at gate leading to J. S. Mullennux's farm, 100 feet west of Big Run, south side of road, in flat rock; bronze tablet stamped "2,355 W. Va."	2,352.915

	Feet.
Red Creek Junction, 2.9 miles east of, 550 feet east of Henry Hoffman's dwelling, north side of road; chiseled square, painted "T. B. M. 2,325" on fence-post	2,322.23
Red Creek Junction, 4.0 miles east of, south side of railroad grade, in root of large beech tree; copper nail and washer, marked "T. B. M. 2,358"	2,355.85
Laneville, 100 feet west of post-office, 125 feet north of road, in large pointed rock; bronze tablet stamped "2,516 W. Va."	2,513.758
Laneville, 1.1 miles east of, south side of Red Creek, at road crossing, in large rock; chiseled square, painted "T. B. M. 2,612"	2,609.27
Laneville, 2.1 miles east of, on Red Creek road, south side, in large flat rock; chiseled square, painted "T. B. M. 2,997"	2,994.39
(New) Hopeville, 7.4 miles west of, on Red Creek road, north side of road, in large boulder; chiseled square, "T. B. M. 3,734" painted on rock	3,731.22
(New) Hopeville, 7.1 miles west of, on Red Creek road, on Monongahela National Forest Reservation, north side of road, in large boulder; bronze tablet stamped "3,888 W. Va."	3,885.700
(New) Hopeville, 6.1 miles west of, on Red Creek road, 50 feet east of **Big Spring,** north side of road, in large boulder; chiseled square, "T. B. M. 3,919" on rock	3,916.29
(New) Hopeville, 5.1 miles west of, on Red Creek road, 1,000 feet north of woods road, west side, in large rock; chiseled square, "T. B. M. 3,368" painted on rock	3,365.68
(New) Hopeville, 4.1 miles west of, on Red Creek road, 1,500 feet west of Robert Heavener's cabin, south side of road, in large rock; bronze tablet stamped "2,838 W. Va."	2,835.037
(New) Hopeville, 3.1 miles west of, on Red Creek road, north side, in large ledge of rocks; chiseled square, marked "T. B. M. 2,442" on rocks	2,438.88
(New) Hopeville, 2.1 miles southwest of, on Red Creek road, south side, in ledge of rocks; chiseled cross, marked "T. B. M. 1,927"	1,924.53
(New) Hopeville, 1.0 mile southwest of, 180 feet north of Red Creek road, west side of road, in large flat rock; bronze tablet stamped "1,477 W. Va."	1,474.401

PARSONS QUADRANGLE: PRESTON, RANDOLPH, AND TUCKER COUNTIES.

(Latitude 39° 00′-39° 15′; longitude 79° 30′-79° 45′.)

Leveling by F. T. Willis and J. H. Wetzel in 1905.

From Porterwood south to edge of quadrangle (single spur line).

Pheasant Run Post-office, on right bank of Pheasant Run, 100 feet upstream from wooden bridge, in large flat stone; aluminum tablet stamped "1738 Adj 1903"	1,737.731

Feet.

Pheasant Run Post-office, 3 miles south of, 100 feet south of Harman Hanford's residence, on side of hill, 4 feet south of road, in ledge of rock; aluminum tablet stamped "1898 Adj 1903" 1,898.187

PICKENS QUADRANGLE: RANDOLPH, UPSHUR, AND WEBSTER COUNTIES.

(Latitude 38° 30′-38° 45′; longitude 80° 00′-80° 15′).

Leveling by L. F. Biggs in 1912 and K. E. Schlachter in 1913.

From West Huttonsville southwest along highway to Star, thence northwest along lumber railroad to Palace Valley.

West Huttonsville, 50 feet south of post-office, west edge of road, in front of L. M. Zickefoose's residence, in boulder; bronze tablet stamped "2322 B 7 1912" 2,321.237

West Huttonsville, 0.8 mile southwest of, north edge of road; chisel point on boulder, chiseled "2617 U. S." 2,616.94

West Huttonsville, 2 miles southwest of, 50 feet west of Left Fork of Middle Fork; spike in base of 12-inch maple tree, scribed "2473 U. S." 2,472.25

Summit of mountain, 1.4 miles east of, north edge of road; copper nail in base of 30-inch linden tree, scribed; aluminum tag stamped "2824 U. S." 2,823.76

Summit of mountain, 0.2 mile east of, south side of road, in top of large boulder; bronze tablet stamped "3220 B 8 1912" 3,219.231

Summit of mountain, west of road; chisel point on boulder, chiseled "3280 U. S." 3,279.79

Star, 2.1 miles east of, north of road, opposite first house from railroad, chisel point on boulder, chiseled "3016 U. S." 3,016.04

Star, 80 feet south of West Huttonsville road crossing, 10 feet west of track, in very large rock; bronze tablet stamped "2308 B 9 1912" 2,307.783

Palace Valley, 1.7 miles southeast of, 500 feet west of switch, south edge of track; chisel point on boulder, chiseled "2205 U. S." 2,204.90

From Hacker Valley east along Pickens & Hacker Valley R. R. to Pickens, portion of line. (There is an error of 1 foot to be located in this line. See Hacker Valley Quadrangle for other bench marks.)

Pickens, 3.5 miles west of, 500 feet west of railroad and road crossing in gap, in rock south of margin of track; bronze tablet stamped "2883" *2,883.095

From Selbyville south along Baltimore & Ohio R. R. to point near Newlon.

Newlon, 0.5 mile south of, at sixty-sixth mile-post, at north side of third joint south of; top of east rail, painted "1929.6" 1,929.4

*Or 1 foot higher.

From Silica southeast along Baltimore & Ohio R. R. to Pickens.

	Feet.
Silica, 2,300 feet south of, in west corner of north abutment of railroad bridge 72A, at seventy-second mile-post; bronze tablet stamped "2385"	2,384.704
Pickens, 2 miles north of, at seventy-third mile-post, at south side of joint opposite; top of east rail, painted "2500"	2,499.7
Pickens, 1 mile north of, at seventy-fourth mile-post, at south side of first joint north of; top of west rail, painted "2615.7"	2,615.7
Pickens, in top stone in northwest corner of retaining wall at the residence of Mr. Wasmer; bronze tablet stamped "2701"	2,700.919
Pickens, 0.5 mile south of, on road to Florence, in rock west margin of highway; chiseled square, painted "2802.3"	2,802.346

From point near Samp east along highway to Monterville, thence north and west to Pickens.

Samp Post-office, 3.5 miles west of, in Big Run, in ledge north side of road; bronze tablet stamped "2022"	2,021.327
Samp Post-office, 1.2 miles west of, south edge of road, in rock; raised chiseled square, painted "2178.6"	2,178.23
Samp Post-office, 0.5 mile east of, 350 feet below Whitaker Falls, in ledge north side of road; bronze tablet stamped "2164"	2,163.708
Samp Post-office, 1.8 miles east of, up Elk River road, in rock south margin of road; raised chiseled square, painted "2271.2"	2,270.82
Store, junction of Valley and Dry Forks, 0.3 mile west of, down Elk River road, in rock north margin of road; chiseled square, painted "2270.2"	2,269.72
Blue Spring, 2.1 miles west of, at fork of road, at junction of Valley and Dry Forks, in rock north edge of road; bronze tablet stamped "2299"	2,298.369
Blue Spring Post-office, 1.1 miles west of, in rock north margin of road, chiseled square, painted "2525.5"	2,525.10
Monterville Post-office, 0.3 mile west of, down Valley Fork road ¼ mile west of summit, in rock in north margin of road; bronze tablet stamped "2949"	2,948.457
Monterville Post-office, in foundation post at southeast corner of old store, at road corner; copper nail, painted "2998.3"	2,997.94
Monterville Post-office, 1.3 miles northwest of, along pike, at road corner to Logan's farm, in bed rock northwest corner; chiseled square, painted "3234.5"	3,234.12
Monterville Post-office, 2 miles northwest of, along Pickens road, 0.3 mile north of pike corner, west margin of road, in boulder; bronze tablet stamped "3237"	3,237.067
Monterville Post-office, 3.3 miles northwest of, along Pickens road, in rock west margin of road; chiseled square, painted "3703.9"	3,703.56
Monterville Post-office, 5.8 miles northwest of, along Pickens road, in rock in east margin of road; chiseled square, painted "3722.3"	3,722.00

	Feet.
Monterville Post-office, 7 miles north of, along Pickens road, under Whitman Knob, in rock east margin of road; bronze tablet stamped "3735"	3,734.868
Pickens, 6.2 miles southeast of, along road to Monterville, in rock south margin of road; chiseled square painted "3655.6"	3,655.23
Pickens, 5.3 miles southeast of, along road to Monterville, in ledge south edge of road, 500 yards southeast of Zehnder's farm; bronze tablet stamped "3775"	3,774.348
Pickens, 4.2 miles southeast of, along Monterville road, at 90° bend in road in front of farm of L. Wuchner, north edge of road, in rock; chiseled square, painted "3621.1"	3,620.77
Pickens, 2.5 miles southeast of, along Monterville road, under Turkeybone triangulation station in rock east edge of road; at root of tree; bronze tablet stamped "3582"	3,581.356
Pickens, 1.1 miles southeast of, along Monterville road, 0.7 mile south of .ork, in rock east margin of road; chiseled square, painted "3025.9"	3,025.37

From Monterville northeast along Valley River R. R. to Lee Bell.

Brady Gate, (1.4 miles north of **Monterville**), 1.5 miles east of, along Elkwater road, in root of large white oak, north side of road; copper nail painted "2627.6"	2,627.19
Elkwater Camp No. 4, 70 feet in front of mess house, in rock between highway and railroad track; bronze tablet painted "2395"	2,394.079
Elkwater Camp No. 4, 1.1 miles east of, 300 feet east of house, at east side of road crossing; on north rail, painted "2290.4"	2,289.9
Spangler Station, 0.5 mile north of, at Elkwater switch, in ledge east side of track; bronze tablet stamped "2171"	2,170.846
Ninth mile-post, at north end of third joint north of post; top of west rail, painted "2137.8"	2,137.3
Lee Bell Schoolhouse, in face of foundation stone at northeast corner; bronze tablet stamped "2066"	2,065.746

SAGO QUADRANGLE: BARBOUR, RANDOLPH, AND UPSHUR COUNTIES.

(Latitude 38° 45′-39° 00′; longitude 80° 00′-80° 15′).

Leveling by G. L. Gordon in 1901, C. W. Arnold in 1911, and L. F. Biggs in 1912.

From Sago east along Coal & Coke Ry. to Midvale, thence south via lumber railroad and highway to West Huttonsville.

Sago, 0.7 mile southeast of, south edge of track, spike in base of road-crossing sign-post, scribed "1468 U. S."	1,468.09
Sago, 2 miles southeast of, south of track; chisel point on east foundation of water-tank, scribed on upright "1570 U. S."	1,569.59

	Feet.
Strader, 0.9 mile south of, railroad bridge over Grassy Creek; chisel point on east end of south abutment; chiseled "1623 U. S."	1,622.471
Strader, 50 feet northwest of station, 30 feet east of old schoolhouse, 50 feet west of track, 50 feet north of wagon road, in boulder; bronze tablet stamped "1695 B 1 1912"	1,694.564
Goodwin, in front of center of station; top of north rail; marked "1778 U. S."	1,777.5
Goodwin, 200 feet southeast of station, 50 feet south of track; copper nail in base of 15-inch maple tree, scribed "1765 U. S."	1,764.55
Goodwin, 0.8 mile northeast of, 20 feet east of track, 20 feet north of wagon road; chisel point on boulder, chiseled "1810 U. S."	1,809.47
Sand Run, 1 mile west of, 500 feet east of rock quarry, 25 feet south of track; chisel point on boulder under walnut tree, chiseled "1902 U. S."	1,901.49
Sand Run, in front of station; top of rail, marked "1958 U. S."	1,957.4
Sand Run, 0.2 mile north of, 180 feet south of tunnel, 10 feet west of track, in ledge; bronze tablet stamped "1977 B 2 1912"	1,977.034
Bentley Wye, in front of station sign-board, top of west rail	1,962.0
Midvale, 0.8 mile west of, 250 feet south of old sawmill, west of track; chisel point on boulder, chiseled "1909 U. S."	1,908.84
Midvale, 200 feet south of station, in east end of north abutment of railroad bridge over Middle Fork River; bronze tablet stamped "1860 B 3 1912"	1,859.308
Ellamore, 150 feet east of post-office, 12 feet north of track; chisel point on boulder; chiseled "1842 U. S."	1,841.26
Ellamore, 1.1 miles south of, west edge of track; spike in base of 20-inch chestnut tree, scribed "U. S. 1857"	1,856.35
Ellamore, 2.9 miles south of, south edge of track, north edge of Left Fork of Middle Fork River, opposite farmhouse, 500 feet west of road crossing; copper nail in base of 2½-foot oak tree, scribed "1852 U. S."	1,851.99
Mouth of Kettle Run, 0.5 mile north of, 650 feet west of road crossing, 10 feet north of track, 10 feet south of wagon road, in boulder; bronze tablet stamped "1869 B 4 1912"	1,868.170
Mouth of Kettle Run, 0.7 mile south of, west edge of track; chisel point on boulder; chiseled "1878 U. S."	1,877.23
Top of west rail at road crossing near old bridge, painted on crossing "1886 U. S."	1,885.9
Mouth of Kettle Run, 1.6 miles south of, 40 feet north of track, in center of road; chisel point on boulder, chiseled "1896 U. S."	1,895.56
Cassity, 3.2 miles north of, west edge of track, east edge of Left Fork of Middle Fork River; copper nail in base of 1½-foot gum tree, scribed "1936 U. S."	1,935.97
Cassity, 1.4 miles north of, east edge of track, 350 feet north	

	Feet.
of road crossing, in boulder; bronze tablet stamped "1991 B 5 1912"	1,990.930
Cassity, 300 feet south of boarding house, 300 feet south of lumber company's engine house, 50 feet south of Cassity Fork, 35 feet southeast of track; copper nail in base of 18-inch spruce tree, scribed "2021 U. S.", aluminum tag stamped "2021 U. S."	2,020.18
Cassity, 0.8 mile south of, east end of south abutment of wagon bridge over Left Fork of Middle Fork River; chisel point, chiseled "2046 U. S."	2,045.25
Cassity, 2.4 miles south of, 40 feet east of track, 0.8 mile north of Stonecoal Run, 250 feet south of farmhouse, 100 feet west of wagon road; in ledge; bronze tablet stamped "2101 B 6 1912"	2,100.164
Mouth of Stonecoal Run, 150 feet north of, west edge of track, 100 feet south of house; copper nail in base of 3-foot spruce tree, scribed "2119 U. S.", aluminum tag stamped "2119 U. S."	2,118.28
Mouth of Stonecoal Run, 1 mile south of, west side of Left Fork of Middle Fork River where railroad right of way crosses it; copper nail in base of 2-foot birch tree, scribed; aluminum tag stamped "2158 U. S."	2,157.90
West Huttonsville, 1.9 miles north of, 600 feet south of mouth of Laurel Branch, 200 feet south of foot-bridge, west edge of road, east edge of rock, 600 feet west of farmhouse; chisel point on boulder, chiseled "2214 U. S."	2,213.37
West Huttonsville, 1.1 miles north of, west edge of road at forks, 700 feet north of farmhouse; chisel point on boulder; painted "2264 U. S."	2,263.41

SPRUCE KNOB QUADRANGLE: PENDLETON, POCAHONTAS, AND RANDOLPH COUNTIES.

(Latitude 38° 30′-38° 45′; longitude 79° 30′-79° 45′).

Third order leveling by E. E. Harris in 1921:

From Horton Quadrangle along highways southwest to Osceola, thence northwest into Horton Quadrangle.

Horton, 7.19 miles south of, at north end of railroad trestle, in top face of sill between tracks; copper nail and washer, guard-rail marked "U. S. B. M. 3,225.3"	3,225.55
Horton, 8.22 miles south of, on east side of track, near south end of fenced-in field, on top of boulder; chiseled square, fence marked "U. S. B. M. 3,284.3"	3,284.52
Horton, 8.96 miles south of, 15 feet south of track, 350 feet east of switch, in sharp turn in railroad, on top of large flat boulder; chiseled square, telegraph-pole marked "U. S. B. M. 3,330.7"	3,330.90
Witness bench mark, 33 feet north 10° west of tablet, on top of boulder; chiseled square	3,427.40
Horton, 9.70 miles south of, 1.62 miles northeast of **Osceola**, 15 feet east of track, in top of large sandstone boulder;	

	Feet.
bronze tablet stamped "3430 W. Va. 1921 H 102", boulder marked "U. S. B. M. 3,430"	3,430.263
Osceola, 0.68 mile north of, 30 feet west of road, north side of wire fence, just west of gate, on top of boulder; chiseled square, telephone-pole marked "U. S. B. M. 3,488.3"	3,488.48
Osceola, 200 feet west of post-office, 100 feet west of T-road north, 40 feet north of center of road, in south root of 7-inch elm tree; copper nail and washer, tree marked "U. S. B. M. 3,513.1"	3,513.29
Osceola, 1.35 miles northwest of, 500 feet northwest of Osceola School, 50 feet east of center of road, on north side of low gap in center of flat boulder; bronze tablet stamped "3595 W. Va. 1921 H 103", fence-post marked "U. S. B. M. 3,594.8"	3,595.091
Witness bench mark, 33.6 feet south 75° west of tablet, inside fence line, on top of boulder; chiseled square	3,594.19
Osceola, 2.10 miles northwest of, 60 feet north of road, 120 feet west of gate to farmhouse, on top of large boulder; chiseled square, boulder marked "U. S. B. M. 3,321.4"	3,321.64
Osceola, 3.20 miles northwest of, on north edge of road, in roadbed, 10 feet east of southeast corner of shanty, on top of boulder; chiseled square, corner of shanty marked "U. S. B. M. 3,171.4"	3,171.62
Osceola, 3.81 miles northwest of, on north edge of road, on east edge of lane north through gate, on top of small boulder; chiseled square, telephone-pole marked "U. S. B. M. 3,138.4"	3,138.66
Osceola, 4.84 miles northwest of, 80 feet west of Laurel Fork, 55 feet south of sharp turn in road at foot of mountain, 35 feet west of old log road, in top of boulder set in place; bronze tablet stamped "3102 W. Va. 1921 H 104", post marked "U. S. B. M. 3,101.4"	3,101.625
Witness bench mark, 10.7 feet north 20° east of tablet, in top of small boulder; chiseled square	3,101.29
Osceola, 5.60 miles northwest of, on east edge of road, in west root of 12-inch elm tree; copper nail and washer, tree marked "U. S. B. M. 3,385.4"	3,385.65

From near Bartow, Durbin Quadrangle, northeast along highways to point west of Osceola.

Thornwood, 0.57 mile southwest of, west side of track, 25 feet south of second-class road crossing, top of rock ledge; chiseled square, rock marked "U. S. B. M. 2,842.9"	2,843.13
Thornwood, 900 feet west of station, 40 feet north of track, at angle in county road, east side of, in top of rock set in place; bronze tablet stamped "2871 W. Va. 1921 H 123", fence-post marked "U. S. B. M. 2,870.9"	2,871.179
Witness bench mark, 50.7 feet north of tablet, in top of rock at south end of plank walk; chiseled square	2,873.80
Thornwood, 0.87 mile north of, on south edge of road, 20 feet east of gate to pasture, on top of boulder; chiseled square, gate-post marked "U. S. B. M. 2,908.7"	2,908.99

	Feet.
Thornwood, 1.70 miles north of, 30 feet west of road, in north root of 20-inch spruce tree; copper nail and washer, tree marked "U. S. B. M. 3,147.7"	3,147.88
Thornwood, 2.64 miles north of, on east edge of road, in west root of 10-inch oak tree; copper nail and washer, tree marked "U. S. B. M. 3,671"	3,671.04
Thornwood, 3.24 miles north of, in forks of Y-road, on top of **Burner Mountain**, set in top of concrete post; bronze tablet stamped "4094 W. Va. 1921 H 124", tree marked "U. S. B. M. 4,094.1"	4,094.012
Witness bench mark, 68 feet north 30° east of tablet, in south root of 18-inch elm tree; copper nail and washer	4,100.27
Thornwood, 4.07 miles north of, on north edge of road, on hill in road, in south root of 12-inch maple tree; copper nail and washer, tree marked "U. S. B. M. 4,076.5"	4,076.50
Thornwood, 4.78 miles north of, east edge of road, 200 feet south of corner fence-post, in west root of 12-inch tree; copper nail and washer, tree marked "U. S. B. M. 3,994.6"	3,994.67
Thornwood, 5.67 miles north of, 80 feet south of road center, in north root of forked chestnut tree; copper nail and washer, tree blazed and marked "U. S. B. M. 3,912.5"	3,912.62
Thornwood, 6.16 miles north of, 30 feet east of road center, on top of high cleared knob, in top of concrete post; bronze tablet stamped "3914 W. Va. 1921 H 125", tree marked "3,914.3"	3,914.424
Witness bench mark, 49 feet north 40° west of tablet, in east root of 15-inch maple tree; copper nail and washer	3,914.24
Thornwood, 7.40 miles north of, 20 feet east of road center, 20 feet south of gate, in fence line, in west root of 20-inch oak tree; copper nail and washer, tree marked "U. S. B. M. 3,827.9"	3,828.11
Thornwood, 8.21 miles north of, 20 feet east of road center, at south edge of big clearing, on top of boulder; chiseled square, boulder marked "U. S. B. M. 3,729.7"	3,729.91
Thornwood, 8.76 miles north of, 0.84 mile west and 5.98 miles south of **Osceola**, 50 feet south of road center, 80 feet north of wire fence line, 40 feet east of rail fence line, 456 feet east of sheep-shed, in top of concrete post; bronze tablet stamped "3739 W. Va. 1921 H 126", fence marked "U. S. B. M. 3,738.5"	3,738.763
Witness bench mark, 95.3 feet south 15° west of tablet, in east root of locust tree; copper nail and washer	3,738.78
Osceola, 0.84 mile west by 5.26 miles south of, in center of trail, in line with trail east through gate, 150 feet north of scales, on top of large boulder; chiseled square, fence marked "U. S. B. M. 3,811.3"	3,811.56
Osceola, 0.84 mile west by 4.28 miles south of, on east edge of road, in sharp turn in road, 0.23 mile north of **Stark School**, on top of large boulder, south of run crossing road; chiseled square, boulder marked "U. S. B. M. 3,677.9"	3,678.17
Osceola, 0.84 mile west by 3.48 miles south of, 50 feet southeast of road forks, 600 feet northeast of C. Lance's	

	Feet.
dwelling, 10 feet west of fence line, set in top of concrete post; bronze tablet stamped "3637 W. Va. 1921 H 127", gate-post marked "U. S. B. M. 3,636.5"	3,636.823
Witness bench mark, 83.5 feet west of tablet, on top of large boulder;. chiseled square	3,633.03
Osceola, 0.84 mile west by 2.72 miles south of, 30 feet north of road, 20 feet south of wire fence line, 50 feet west of gate, on top of large boulder; chiseled square, boulder marked "U. S. B. M. 3,707.6"	3,707.85
Osceola, 0.84 mile west by 1.85 miles south of, on south edge of road, 40 feet east of gate, in angle of road, on top of boulder; chiseled square, boulder marked "U. S. B. M. 3,651.7"	3,651.97
Osceola, 0.84 mile west by 0.90 mile south of, on west edge of road, in north root of 30-inch maple tree; copper nail and washer, tree marked "U. S. B. M. 3,533.5"	3,533.85
Osceola, 1.35 miles northwest of, 500 feet northwest of **Osceola School,** 50 feet east of road center, north side of low gap, in top of flat boulder; bronze tablet stamped "3595 W. Va. 1921 H 103"	3,595.091

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